EL-MOASSER
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SCIENCE

The Main Book

By A Group of Supervisors

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The Main Book

GPS

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For printing, publication & distribution
El Faggala - Cairo - Egypt
Tel.: 02/ 259 340 12 - 259 377 91
e-mail: info@elmoasserbooks.com
15014 www.elmoasserbooks.com

4th Primary
2024
FIRST TERM

Name : .....

School : .....

Class : .....

Year : .....

Egyptian National Library
Cataloging - in - publishing
prepared by Technical Affairs Department
El-Moasser Science
by a group of supervisors. -
Cairo: GPS for printing, publication and distribution, 2023
3 vols; 30 cm.
For 4th primary first term.
I.S.B.N.: 978 - 977 - 839 – 704 – 8
1- Science - study and teaching (primary) 372.35
2- Education, primary.
Dep. No. 8743 / 2023

Introduction

Dear parents... At the beginning of the third millennium, forming a new Egyptian character should be given due care and attention. That character should be equipped with values, skills and knowledge to cope with the world rapidly changing development.

The pre-university educational system has already developed to be aligned with the sustainable development strategy (Egypt vision 2030). It stems from a firm belief that the traditional curriculum based on spoon-feeding strategy is no longer sufficient.
We should move to a new science curriculum which adopts a student-centered strategy. This strategy enhances our children's communication skills and develops their problem solving and critical thinking skills.

El-Moasser Book Series has the honour to present you "the Parent's guide" for the "science" textbook.
For the primary stage, grade four.
This guide introduces a wide range of interesting activities which support the science textbook themes. In addition, it presents full detailed instructions for parents, to support their children in their learning process. El-Moasser believes in making the learning process a pleasure which starts from the classroom and continues at home.

THE AUTHORS

New Application GPS

GPS

Interactive application presented from...

EL-MOASSER

How to use the application ?

1 Download the app

GET IT ON Google Play

Download on the App Store

2 Create an account

Student account

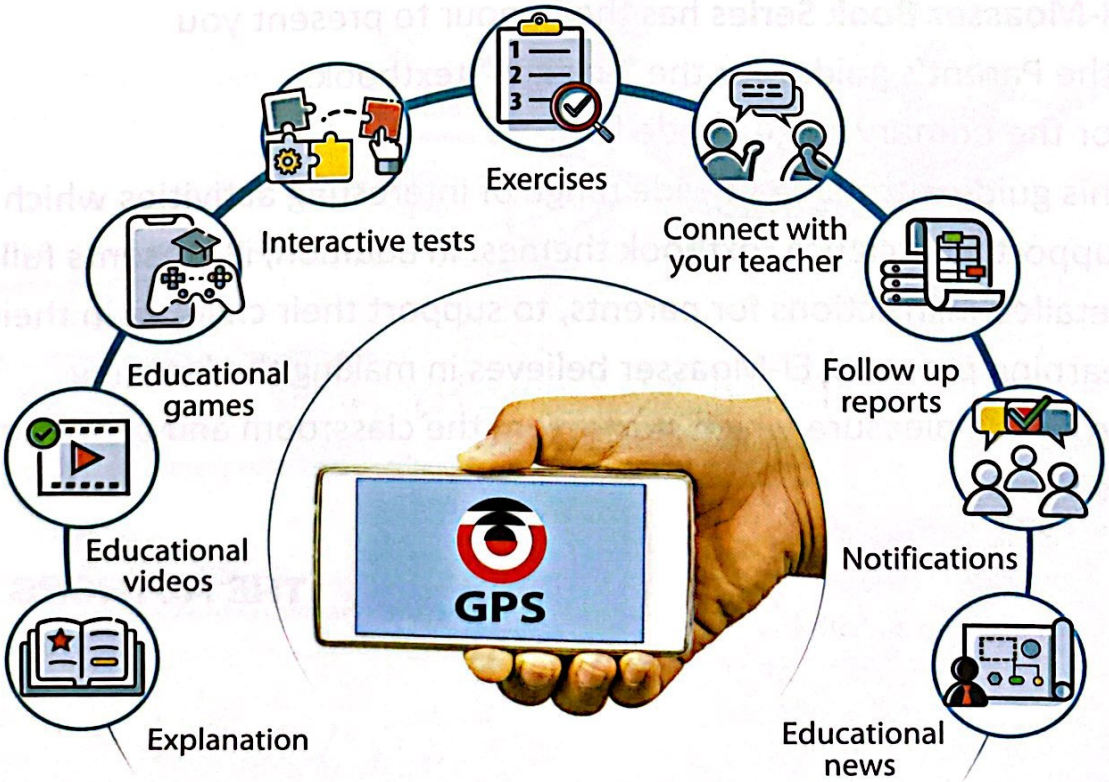
Parents account

Teacher account

3 Use the book code

You can find the code on the back cover of the book.

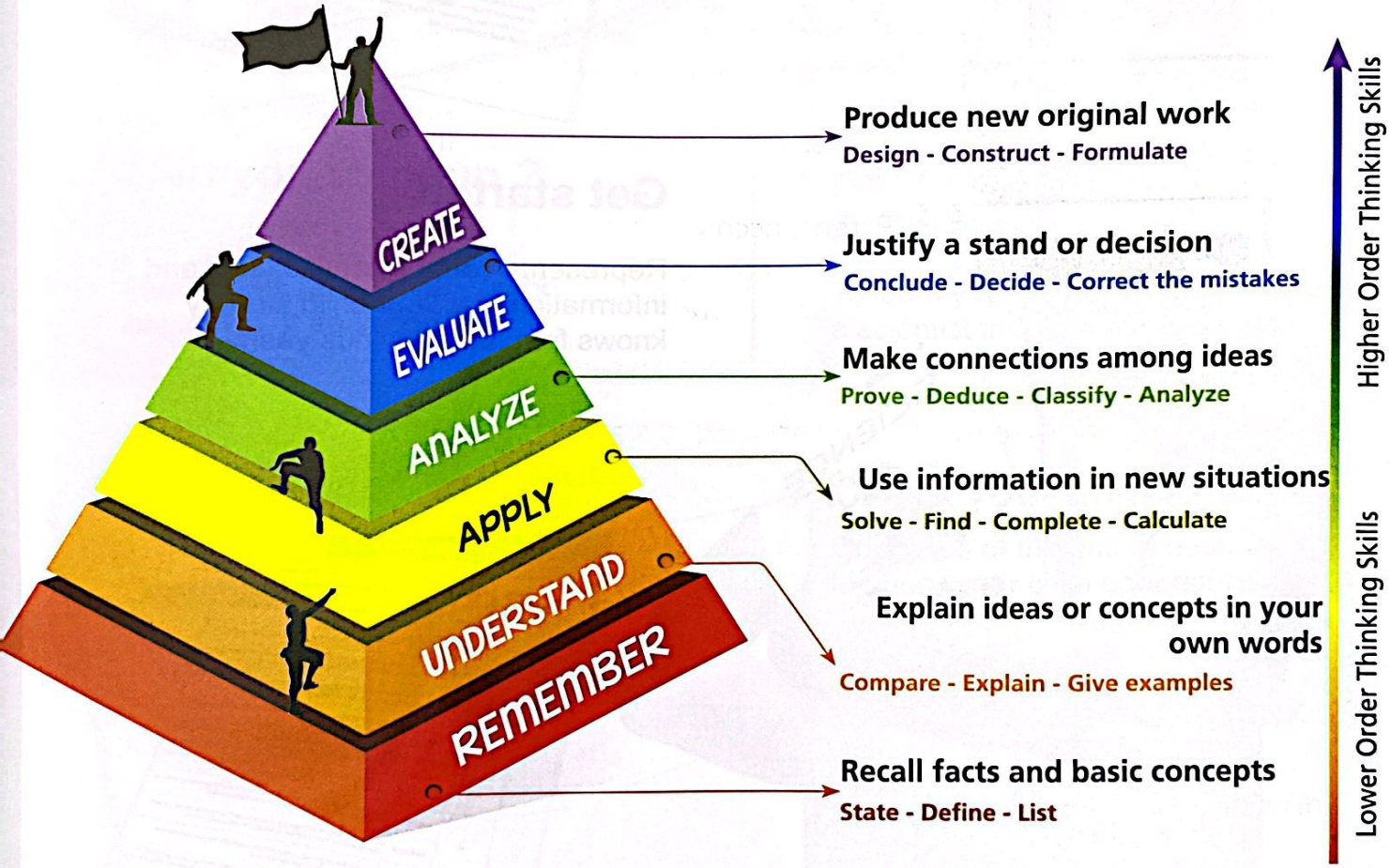
Enjoy Interactive learning on all subjects and get all the app features free.



Bloom's Taxonomy Of Cognitive Levels

Bloom's Taxonomy is an educational classification created by Benjamin Bloom, it is often represented as a pyramid. This taxonomy was revised to include six cognitive levels graded form the lower level to the higher level as follows:

REMEMBER → UNDERSTAND → APPLY → ANALYZE → EVALUATE → CREATE



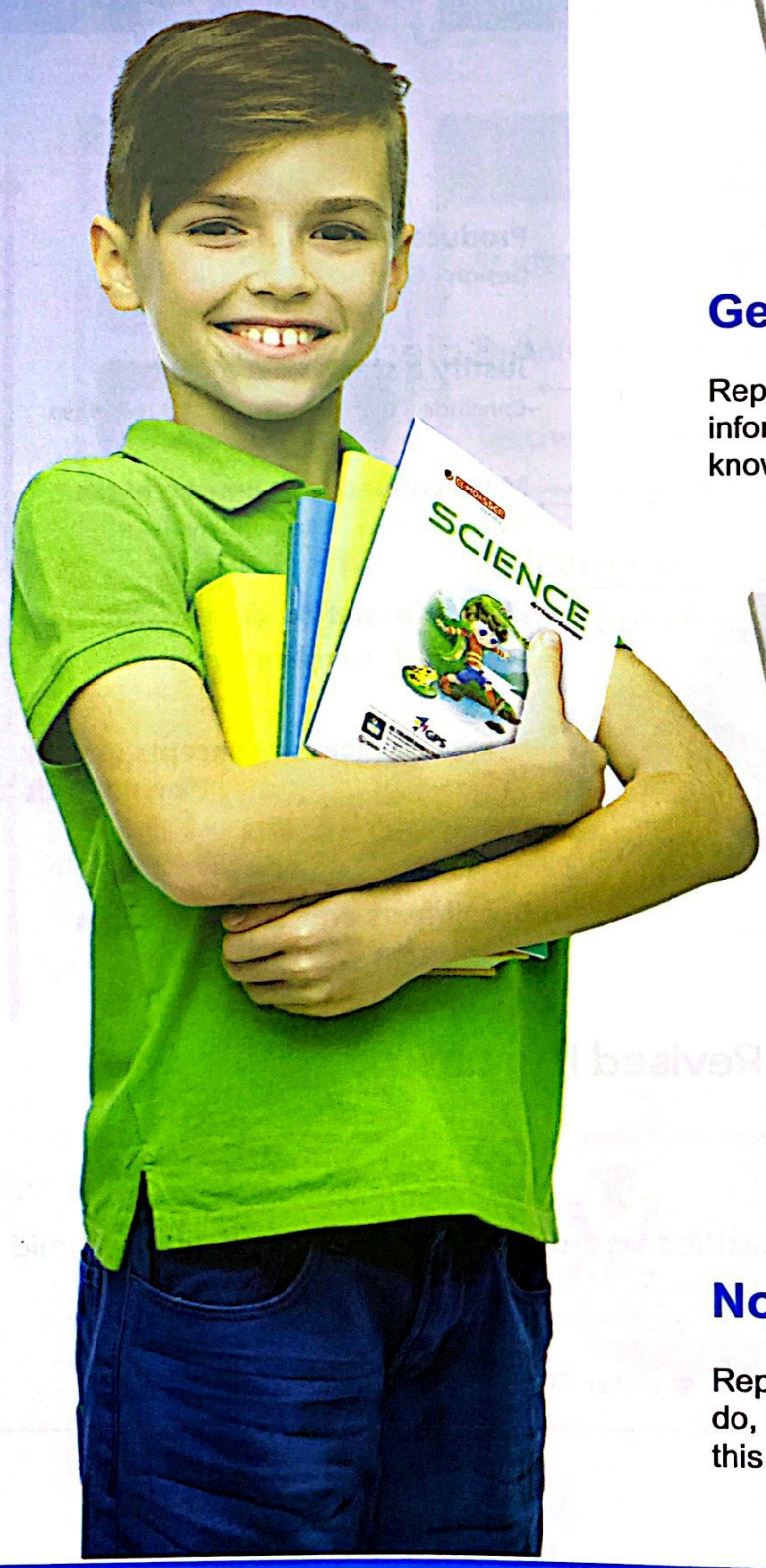
Bloom's Revised Pyramid

Note :

Questions within each exercise are classified according to the levels of Bloom's pyramid and are referred to as follows:

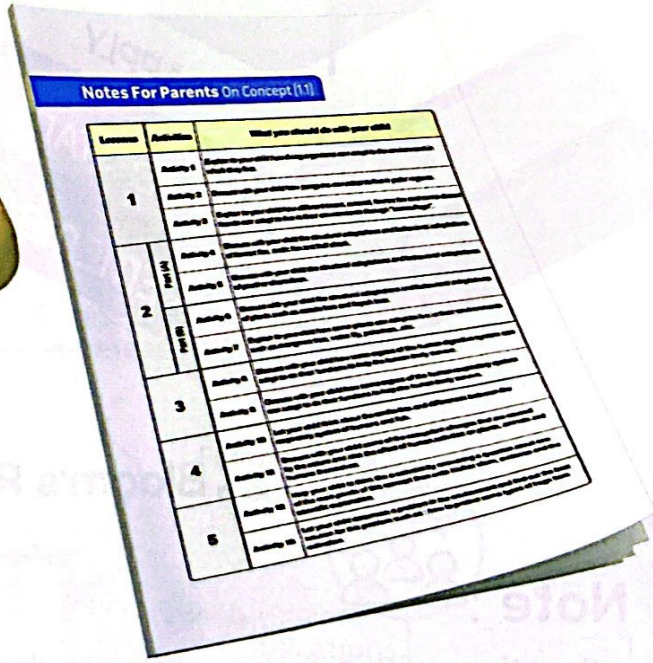
● UNDERSTAND ○ APPLY ● Higher Thinking Skills

How to use this guide ?



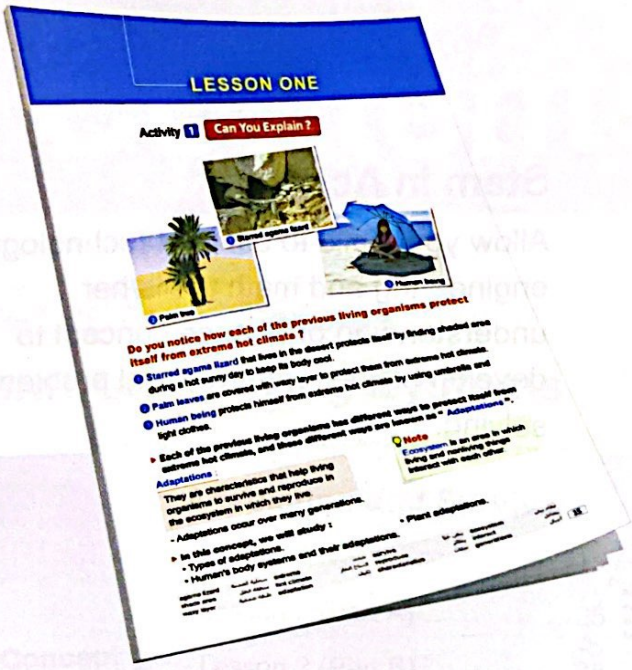
Get started

Represents some scientific facts and information that your child already knows from the previous years.



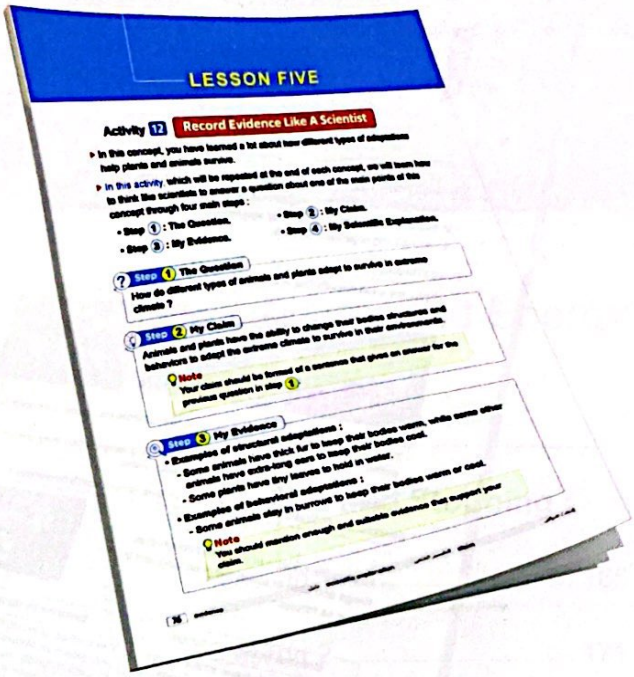
Notes for parents

Represents what the parents should do, to help their child to understand this activity.



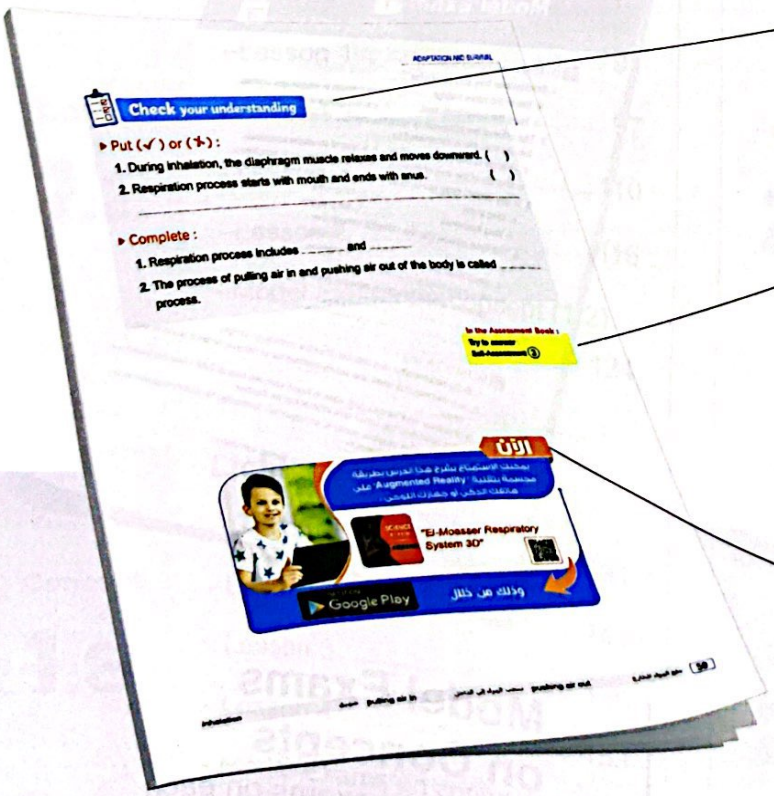
Can you Explain ?

Represents an overview at the beginning of each concept.



Record Evidence like A Scientist

To learn your child how to think like a scientist through four main steps.



Check your understanding

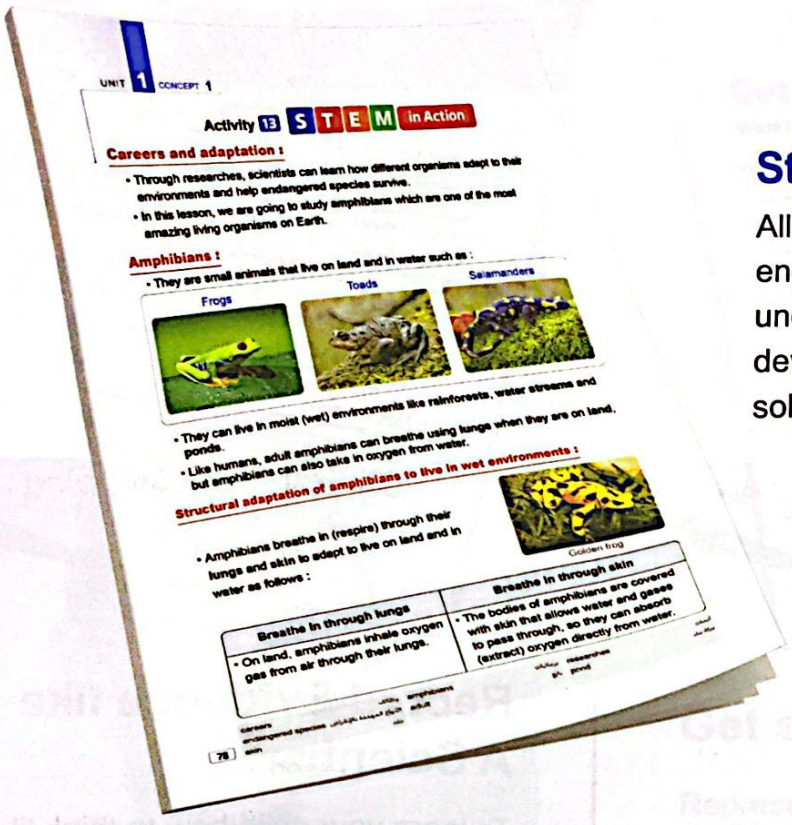
Questions at the end of each activity to check your child understanding.

In the Assessment Book

A hint for your child to answer the self-assessments on lessons in the “Assessment Book”.

Augmented Reality lessons

Scan the QR code to enjoy studying the human body systems through the “Augmented Reality” lessons.


UNIT 1 CONCEPT 1

Activity 13 STEM in Action

Careers and adaptation :

- Through researches, scientists can learn how different organisms adapt to their environments and help endangered species survive.
- In this lesson, we are going to study amphibians which are one of the most amazing living organisms on Earth.

Amphibians :

- They are small animals that live on land and in water such as :

Frogs Toads Salamanders

- They can live in moist (wet) environments like rainforests, water streams and ponds.
- Like humans, adult amphibians can breathe using lungs when they are on land, but amphibians can also take in oxygen from water.

Structural adaptation of amphibians to live in wet environments :

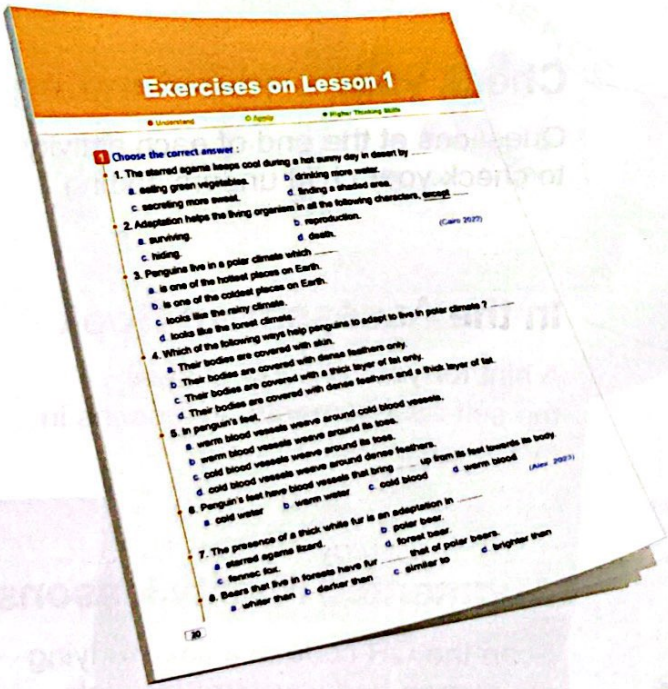
- Amphibians breathe in (respire) through their lungs and skin to adapt to live on land and in water as follows :

Golden frog

Breathe in through lungs	Breathe in through skin
• On land, amphibians inhale oxygen gas from air through their lungs.	• The bodies of amphibians are covered with skin that allows water and gases to pass through, so they can absorb (extract) oxygen directly from water.

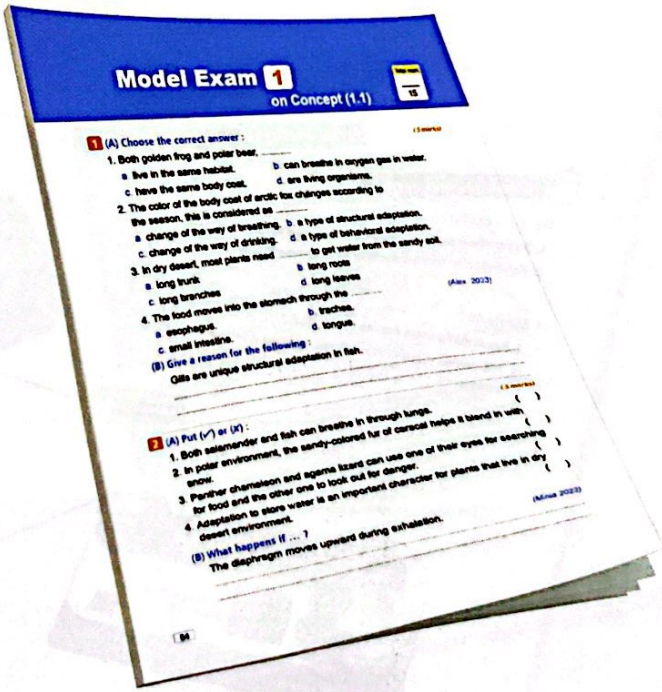
Stem in Action

Allow your child to connect technology, engineering and math to his/her understanding of science concept to develop his/her creativity and problem-solving.


Exercises on Lesson 1

1 Choose the correct answer :

1. The starred agama keeps cool during a hot sunny day in desert by ____
   a. eating green vegetables. b. drinking more water.
   c. secreting more sweat. d. finding a shaded area.
2. Adaptation helps the living organism in all the following characters, except ____
   a. surviving. b. reproduction. (Cairo 2022)
   c. hiding. d. death.
3. Penguins live in a polar climate which ____
   a. is one of the hottest places on Earth.
   b. is one of the coldest places on Earth.
   c. looks like the rainy climate.
   d. looks like the forest climate.
4. Which of the following ways help penguins to adapt to live in polar climate ? ____
   a. Their bodies are covered with skin.
   b. Their bodies are covered with dense feathers only.
   c. Their bodies are covered with a thick layer of fat only.
   d. Their bodies are covered with dense feathers and a thick layer of fat.
5. In penguin's feet, ____
   a. warm blood vessels weave around cold blood vessels.
   b. warm blood vessels weave around its toes.
   c. cold blood vessels weave around its toes.
   d. cold blood vessels weave around dense feathers.
6. Penguin's feet have blood vessels that bring ____ up from its feet towards its body (Alex 2023)
   a. cold water b. warm water c. cold blood d. warm blood
7. The presence of a thick white fur is an adaptation in ____
   a. starred agama lizard. b. polar bear.
   c. fennec fox. d. forest bear.
8. Bears that live in forests have fur ____ that of polar bears.
   a. whiter than b. darker than c. similar to d. brighter than


Model Exam 1 on Concept (1.1)

1 (A) Choose the correct answer : (3 marks)

1. Both golden frog and polar bear, ____
   a. live in the same habitat. b. can breathe in oxygen gas in water.
   c. have the same body cost. d. are living organisms.
2. The color of the body cost of arctic fox changes according to the season, this is considered as ____
   a. change of the way of breathing. b. a type of structural adaptation.
   c. change of the way of drinking. d. a type of behavioral adaptation.
3. In dry desert, most plants need ____ to get water from the sandy soil.
   a. long trunk b. long roots
   c. long branches d. long leaves (Alex 2023)
4. The food moves into the stomach through the ____
   a. esophagus. b. trachea.
   c. small intestine. d. tongue.

(B) Give a reason for the following : (3 marks)

Gills are unique structural adaptation in fish.

2 (A) Put (✓) or (✗) : (3 marks)

1. Both salamander and fish can breathe in through lungs. ( )
2. In polar environment, the sandy-colored fur of camelot helps it blend in with snow. ( )
3. Panther chameleon and agama lizard can use one of their eyes for searching for food and the other one to look out for danger. ( )
4. Adaptation to store water is an important character for plants that live in dry desert environment. ( )

(B) What happens if ... ? (Minia 2023)

The diaphragm moves upward during exhalation.

Exercises on Lessons

Varient questions on each lesson.

Model Exams on Concepts

Two model exams on each concept.

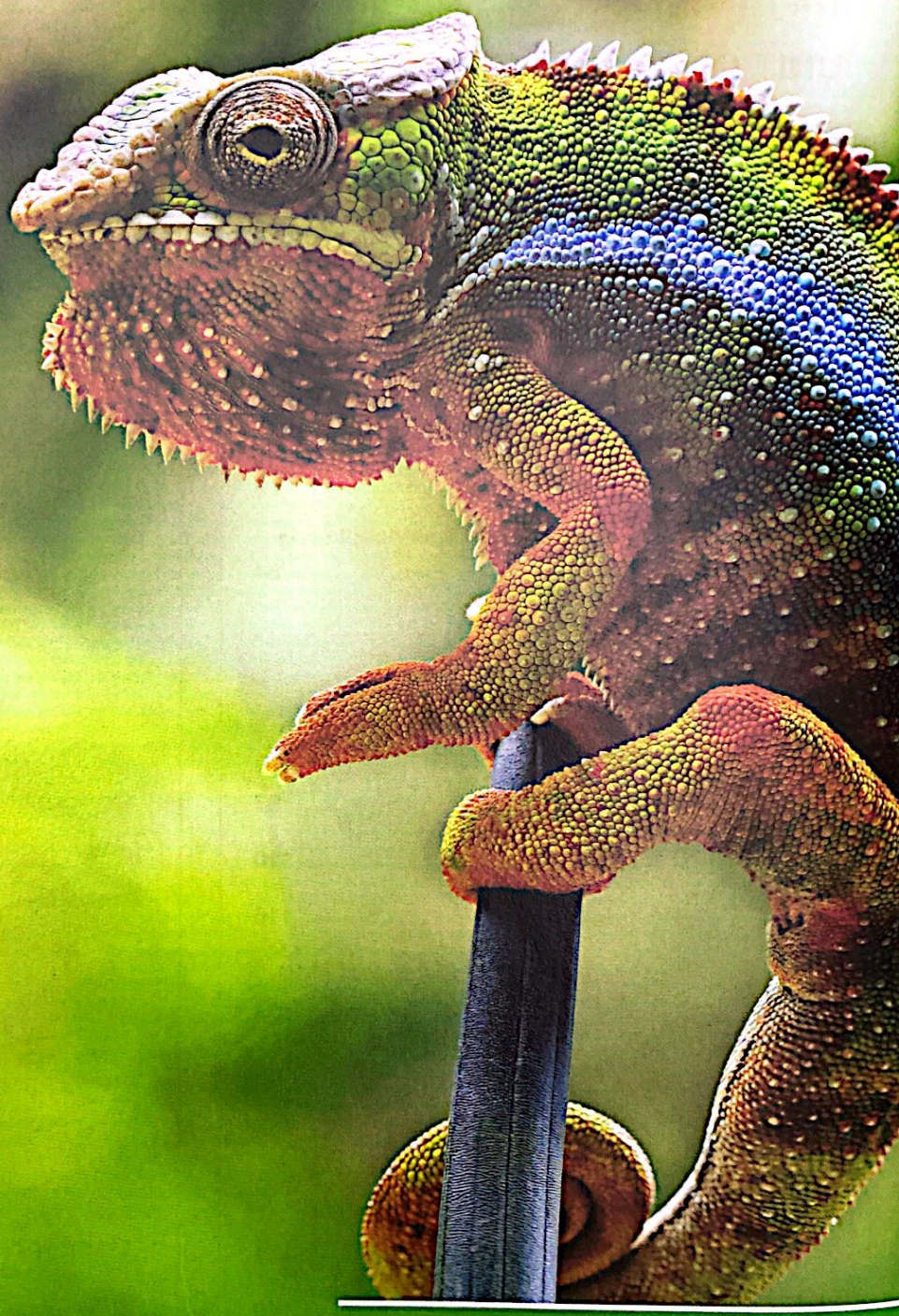
Contents

THEME ONE : Systems
UNIT ONE : **Living Systems**

THEME TWO : Matter and Energy
UNIT TWO : **Motion**

THEME ONE : SYSTEMS

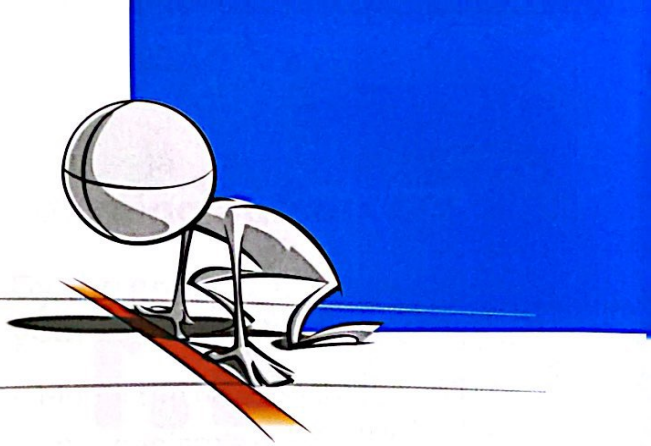
UNIT 1



LIVING SYSTEMS

Get Started

What I Already Know

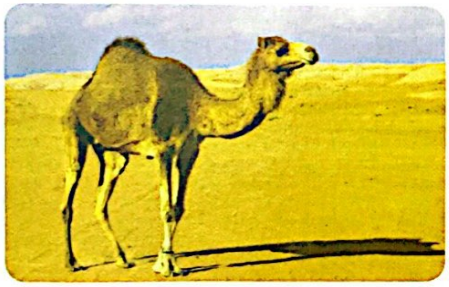


- **There are many factors that affect the life of living organisms in their environments such as :**
  - Hot and cold temperature.
  - Amount of water.
  - Availability of food.
  - Availability of shelter.

- **Overtime, animals and plants adapt or change according to the previous factors, so that they can live, eat, breathe, stay safe and so on.**

Examples :

- Camel's body is covered with a special thick hairy skin to protect it from the hot weather in desert.



Camel

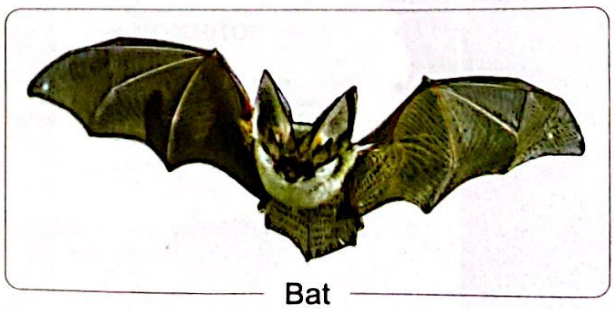
- Palm trees have strong roots to fix them in the soil against strong winds in desert.

Palm tree

- **In this unit, you are going to study :**
  - Types of adaptations of living organisms.
  - How humans and animals use their senses to gather (collect) information.
  - Adaptations of some animals that are active at night.
  - How humans and animals communicate and transfer information.

- **Unit Project : "Bat Chat"**

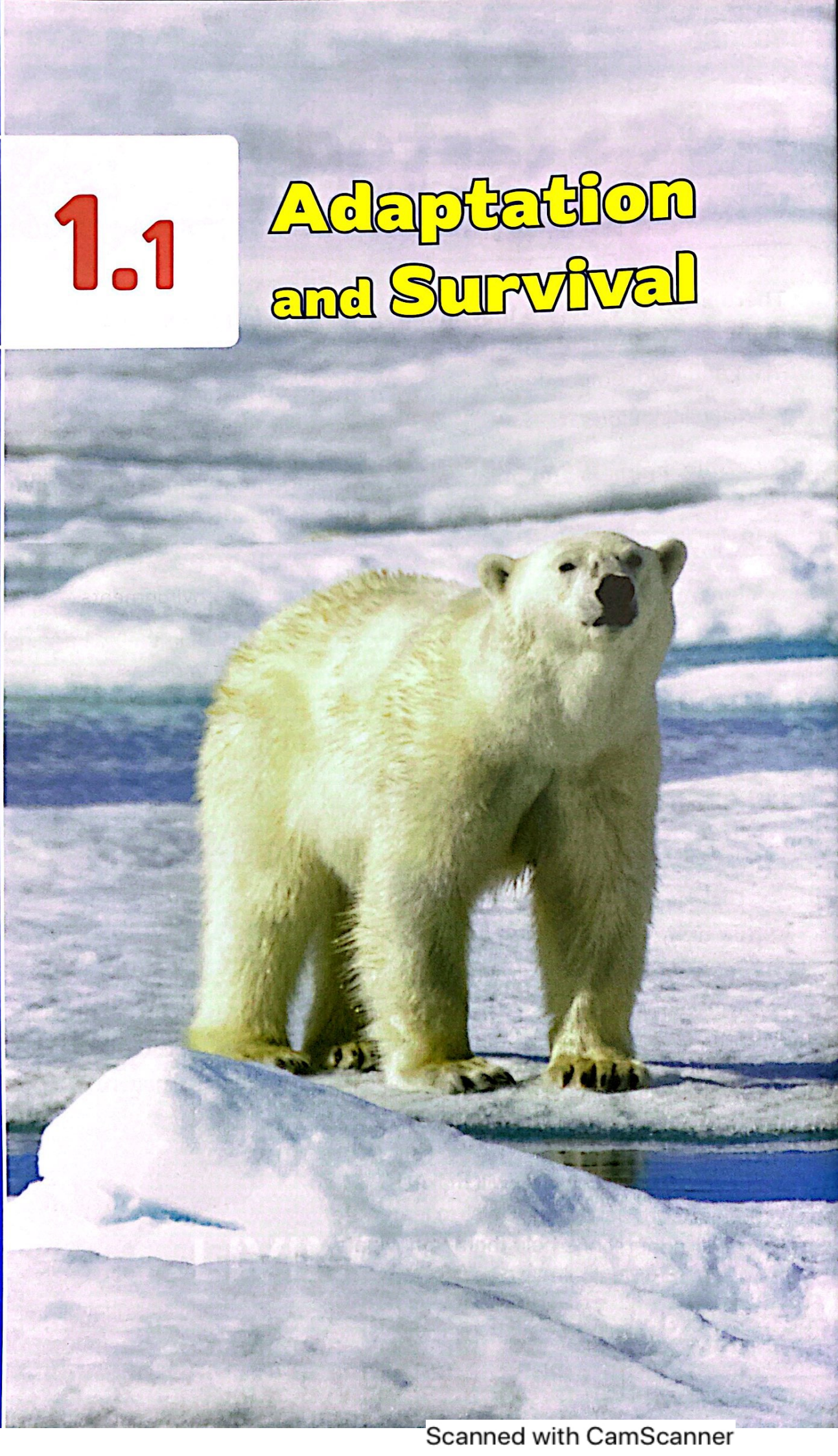
  At the end of this unit, you will make a research project about "Bats" to learn how their adaptations help them to navigate, hunt and communicate.

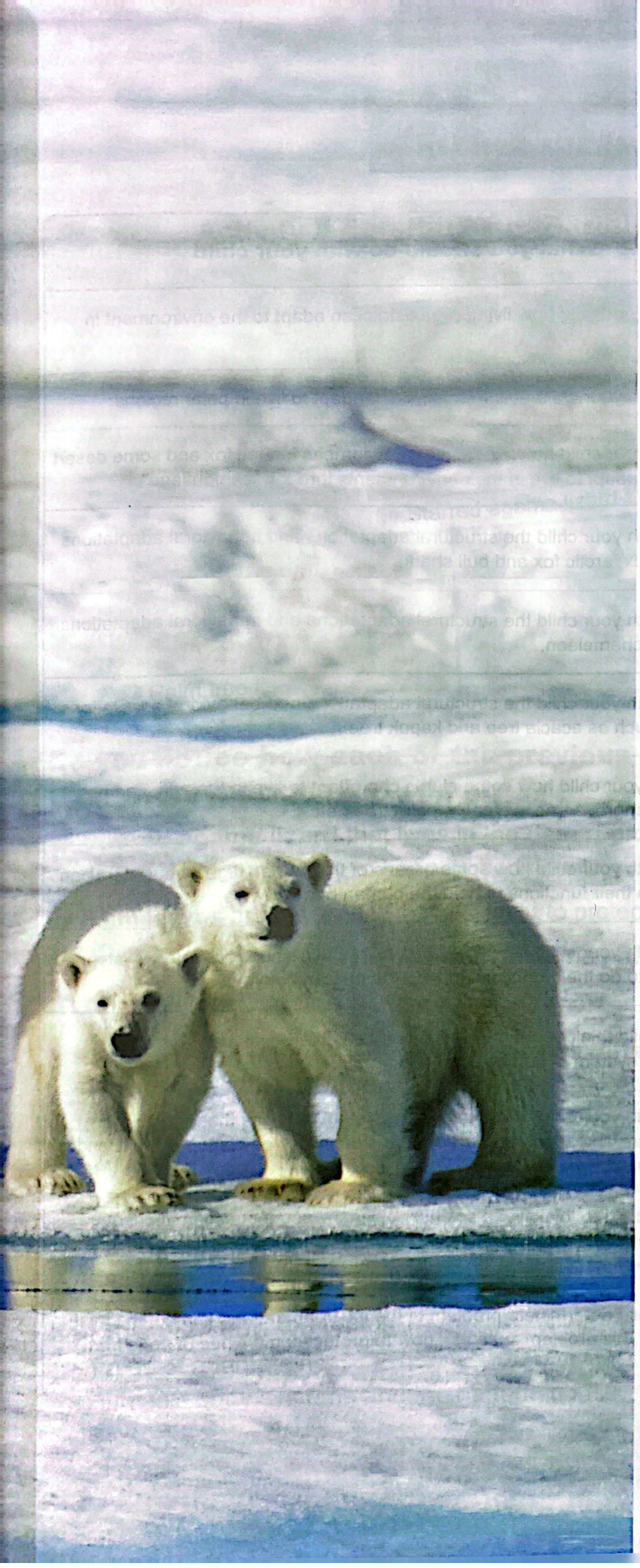


Bat

Concept

1.1 Adaptation and Survival





Learning outcomes

By the end of this concept, your child will be able to :

- Model the relationships among an organism's survival, habitat, adaptations and body systems.
- Argue from evidence that plants and animals have structures and behaviors that help them survive and grow.
- Explain how structural adaptations help organisms survive in specific environments.
- Argue from evidence that multiple adaptations or organs work together in systems to help organisms survive in specific habitats.

Key vocabulary

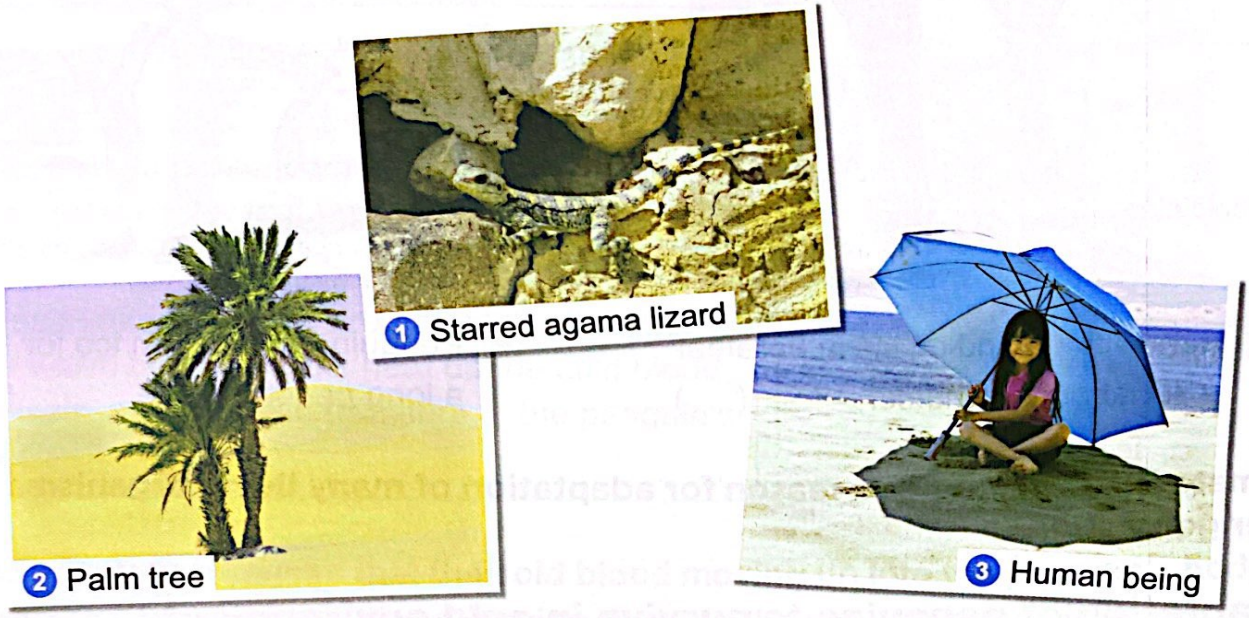
- Adaptation
- Arctic
- Camouflage
- Digestive system
- Ecosystem
- Energy
- Extinct
- Ocean
- Organism
- Pollute
- Predator
- Prey
- Reproduce
- Survive
- Respiratory system

Notes For Parents On Concept (1.1)

Lessons		Activities	What you should do with your child
1		Activity 1	Explain to your child how living organisms can adapt to the environment in which they live.
		Activity 2	Discuss with your child how penguins can adapt to live in polar regions.
		Activity 3	Explain to your child how different bears, caracal, fennec fox and some desert lizards can adapt to live in their environments through "camouflage".
2	Part (A)	Activity 4	Discuss with your child the structural adaptations and behavioral adaptations of fennec fox, arctic fox and bull shark.
		Activity 5	Discuss with your child the structural adaptations and behavioral adaptations of panther chameleon.
	Part (B)	Activity 6	Discuss with your child the structural adaptations and behavioral adaptations of plants such as acacia tree and kapok tree.
		Activity 7	Explain to your child how some plants can adapt to live in their environments such as mangrove tree, water lily, palm tree...etc.
3		Activity 8	Discuss with your child how some organs of the human digestive system can adapt to do their functions to help the human body survive.
		Activity 9	Discuss with your child how some organs of the human respiratory system can adapt to do their functions to help the human body survive.
4		Activity 10	Let your child think about the similarities and differences between the respiratory system of humans and fish.
		Activity 11	Discuss with your child some of the ecosystem changes that are caused by the nature and also the effect of human activities on plants, animals and humans themselves.
5		Activity 12	Help your child to think like a scientist by answering a question about one of the main points of this concept then write his/her claim, evidence and the scientific explanation.
		Activity 13	Let your child determine a problem in the environment and find out the best solution for this problem such as : how to protect some types of frogs from extinction.

LESSON ONE

Activity 1 Can You Explain ?



Do you notice how each of the previous living organisms protect itself from extreme hot climate ?

1. **Starred agama lizard** that lives in the **desert** protects itself by finding shaded area during a hot sunny day to keep its body cool.
2. **Palm leaves** are covered with waxy layer to protect them from extreme hot climate.
3. **Human being** protects himself from extreme hot climate by using umbrella and light clothes.

▸ **Each of the previous living organisms has different ways to protect itself from extreme hot climate, and these different ways are known as " Adaptations ".**

Adaptations :

They are characteristics that help living organisms to survive and reproduce in the ecosystem in which they live.

- Adaptations occur over many generations.

Note

Ecosystem is an area in which living and nonliving things interact with each other.

▸ **In this concept, we will study :**

- Types of adaptations.
- Human's body systems and their adaptations.
- Plant adaptations.

agama lizard	سحلية العجمة	extreme	شديد	survive	يبقى حيًا	ecosystem	نظام بيئى
shade area	منطقة الظل	hot climate	المناخ الحار	reproduce	يتكاثر	interact	يتفاعل
waxy layer	طبقة شمعية	adaptation	تكيف	characteristics	صفات	generations	أجيال

Activity 2 Penguin Feet

▸ **Look at the following pictures, then put (✓) or (✗) :**

1. You can stand on ice in barefeet for about 5 minutes. ( )

2. Penguin can walk on ice for a long period of time. ( )

Climate is considered one reason for adaptation of many living organisms over generations.

Adaptation of penguins to survive in cold environment :

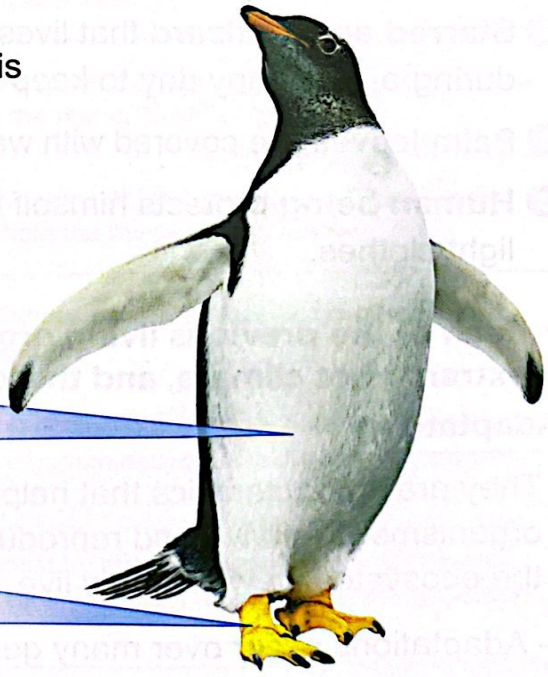
Unlike most birds, penguins cannot fly but they can stand on ice all day.

- **Habitat :**
  Penguin in Antarctica lives in a polar climate that is one of the coldest places on the Earth.

- **Adaptation :**

Its body :
Penguin's body is covered with dense feathers and a thick layer of fat **to keep its body warm**.

Its feet :
Penguin's feet have no feathers.



Penguin

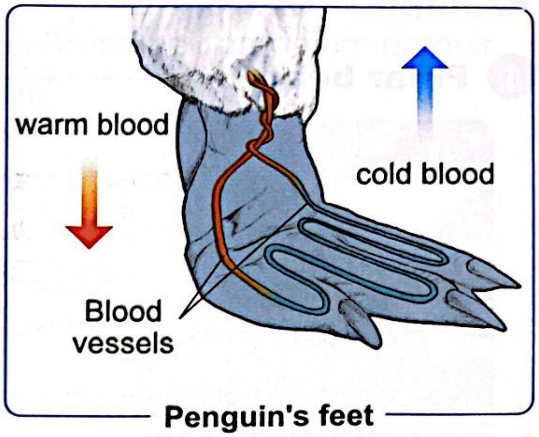
Note
Habitat is the environment where living organisms live in.

barefeet	حافى القدمين	dense feathers	ريش كثيف	polar climate	المناخ القطبى	habitat	موطن
Antarctica	القارة القطبية الجنوبية	penguin	بطريق	warm	دافئ	environment	البيئة

How do the penguin's feet stay warm ?

The penguin's feet stay warm due to the way of moving the blood in blood vessels through its feet as follows :

1. Blood vessels bring cold blood up from the feet.
2. Other blood vessels bring warm blood down to the feet from the feather-coated body.
3. These vessels weave around each other, so the warm blood vessels heat up the cold blood vessels, and the heat transfers to the penguin's feet.



Penguin's feet

- **This adaptation causes that the cold blood moving up into the penguin's body becomes warm and the blood moving down to the penguin's toes is warm enough to keep its toes from freezing.**

Give reason for ...

Penguins' feet help them survive in cold climate.

Because blood vessels that carry warm blood from the body weave around the blood vessels that carry cold blood from the feet. This leads to warming the blood vessels of the penguin's feet to survive in cold climate.

Check your understanding

▸ Put (✓) or (✗) :

1. The blood vessels coming downwards to the penguin's feet carry warm blood. ( )
2. Penguins can adapt to live in extreme cold environment by having feathers and fat in their feet. ( )

blood vessels	أوعية دموية	toes	أصابع الأرجل	weave	نسج
freezing	تجمد	enough	كافى	adapt	يتكيف

Activity 3 Adaptations for Survival

▶ **Some animals have some adaptations that help them survive and reproduce in their different environments.**

Examples :

1 Polar bear

Polar bear

- **Habitat :** Arctic region (polar region).
- **Adaptation :**
  It has white and thick fur :
  - **Its white fur** helps it blend in with the snow as it sneaks up on its prey.
  - **Its thick fur** helps it stay warm in its cold arctic region.

2 Brown bear and black bear

Brown bear

Black bear

- **Habitat :** Forests.
- **Adaptation :**
  They have dark fur to help them hide among the trees when they hunt.

3 Caracal and fennec fox

Caracal

Fennec fox

- **Habitat :** Desert
- **Adaptation :**
  They have sandy-colored fur (tan-colored fur) to help them blend in with desert landscapes.

4 Some desert lizards

Desert lizard

- **Habitat :** Desert
- **Adaptation :**
  They have colorful scales that make them hide among the colorful rocks in the desert.

arctic region	منطقة القطب الشمالي	forests	الغابات	fennec fox	ثعلب الفنك
blend	يندمج	hunt	يصطاد	scales	حراشيف
caracal	القط البري	sneak up	يتسلل	hide	يخفي
landscapes	المناظر الطبيعية				

- **From the previous examples, we notice that some animals adapt in many ways to hide from their predators or their preys by a way of adaptation called "camouflage".**

Camouflage :

It is a type of adaptation that some animals use to hide from their predators or their preys by blending in with the surrounding environments.

Notes

1. Predator is an animal that hunts and eats another animal.
2. Prey is an animal that is hunted and eaten by another animal.

Check your understanding

▸ Put (✓) or (✗) :

1. Polar bear has a dark fur to blend in with the snow. ( )
2. Brown bear lives in arctic region, while polar bear lives in forest. ( )

▸ Complete the following statements :

1. Fennec fox has ..... colored fur to help it blend in with desert landscapes.
2. The type of adaptation that some animals use to hide from their predators or their preys is known as .....

In the Assessment Book :
Try to answer :
Self-Assessment (1)

predator	مفترس	camouflage	التمويه / التخفى
prey	فريسة	surrounding environments	البيئات المحيطة

Exercises on Lesson 1

Understand Apply Higher Thinking Skills

1 Choose the correct answer :

1. The starred agama keeps cool during a hot sunny day in desert by .....
   a. eating green vegetables. b. drinking more water.
   c. secreting more sweat. d. finding a shaded area.
2. Adaptation helps the living organism in all the following characters, except .....
   a. surviving. b. reproduction.
   c. hiding. d. death. *(Cairo 2022)*
3. Penguins live in a polar climate which .....
   a. is one of the hottest places on Earth.
   b. is one of the coldest places on Earth.
   c. looks like the rainy climate.
   d. looks like the forest climate.
4. Which of the following ways help penguins to adapt to live in polar climate ? .....
   a. Their bodies are covered with skin.
   b. Their bodies are covered with dense feathers only.
   c. Their bodies are covered with a thick layer of fat only.
   d. Their bodies are covered with dense feathers and a thick layer of fat.
5. In penguin's feet, ...
   a. warm blood vessels weave around cold blood vessels.
   b. warm blood vessels weave around its toes.
   c. cold blood vessels weave around its toes.
   d. cold blood vessels weave around dense feathers.
6. Penguin's feet have blood vessels that bring ..... up from its feet towards its body.
   a. cold water b. warm water c. cold blood d. warm blood
   (Alex. 2023)
7. The presence of a thick white fur is an adaptation in .....
   a. starred agama lizard. b. polar bear.
   c. fennec fox. d. forest bear.
8. Bears that live in forests have fur ..... that of polar bears.
   a. whiter than b. darker than c. similar to d. brighter than

9. Fennec fox and caracal have..... that help them blend in with desert landscapes. *(South Sinai 2023)*

a. colorful scales b. thick white fur

c. sandy-colored feathers d. sandy-colored fur

10. Desert lizards have ..... that make them hide among the colorful rocks in the desert.

a. tan-colored fur b. colored scales

c. sandy colored feathers d. dark fur

11. Camouflage means that the animal .....

a. can be seen easily among its surrounding environment.

b. is hard to be seen among its surrounding environment.

c. is easily to be seen by its preys.

d. can be seen easily by its predators.

12. Which of the following birds is more difficult to be seen by its predator ?.....

a. A red bird on a green tree. b. A blue bird on a green tree.

c. A yellow bird on a green tree. d. A green bird on a green tree.

2 Choose from columns (B) and (C) what suit them in column (A) :

(A) Animal	(B) Adaptation	(C) Helps it to ...
1. Penguin	a. has dark fur	A. stay warm and hide from preys
2. Caracal	b. has thick white fur	B. keep its body warm
3. Brown bear	c. has thick layer of fat and dense feathers	C. blend in with desert landscapes
4. Polar bear	d. has sandy-colored fur	D. hide among the trees when it hunts

1. ..... → ..... 2. ..... → ..... 3. ..... → ..... 4. ..... → .....

3 Put (✓) or (✗) :

1. The desert lizard blend in with large green trees, to hide from its enemies. ( )
2. Animals that live in hot deserts have special ways to keep their bodies cool during hot sunny days. ( )
3. Living organisms can survive and reproduce in different environments by the help of adaptation. ( )

4. Penguin's body is covered with dense feathers and a thin layer of fat to keep its body warm. ( )
5. Thick white fur is an adaptation in bears that live in polar regions. *(Suez 2023)* ( )
6. The sandy-colored fur of caracal helps it blend in with snow in polar environment. ( )
7. Some types of lizards have colored feathers to help them blend in with rocks in their ecosystem. ( )

4 Complete the following sentences by using these words :

(camouflage – habitat – adaptation – predator – prey)

1. The environment where living organisms live in is called .....
2. An animal that hunts and eats another animal is called a ..... while ..... is an animal that is hunted and eaten by another animal.
3. The characteristic that helps living organisms to survive and reproduce in the ecosystem is known as .....
4. Type of adaptation that some animals use to hide from their predators or their preys is known as ..... *(Sharkia 2022)*

5 Write the scientific term of each of the following :

1. A characteristic that helps living organisms to survive and reproduce in the ecosystem in which they live. (.....)
2. A bird that has a thick layer of fat and dense feathers to adapt extreme cold weather. (.....)
3. It covers the body of some types of bears to blend in with snow and keeps their bodies warm. *(Luxor 2023)* (.....)
4. A type of foxes that has sandy-colored fur to adapt its desert environment. (.....)
5. A property that helps animals to blend in with their surrounding environment. *(Cairo 2022)* (.....)

6 Complete the following sentences :

1. The penguin's body can keep warm through a thick layer of ..... and dense ..... *(Aswan 2023)*
2. A penguin can stand around on ice all day due to the weaving of ..... around each other in its feet.
3. Forest bears have ..... or ..... colored fur, while polar bears have ..... colored fur. *(Cairo 2023)*
4. In desert environment, ... and ..... are covered with sandy-colored fur.

5. Among animals that can live in desert ecosystem are ..... lizard and ..... fox.
6. The fur of a polar bear is thick to keep its body ..... in polar climate, while it has ..... color to blend in with snow.
7. The body of some types of lizards are covered with ..... to blend in with colored rocks in their environments.
8. Among animals that can live in polar environment are ..... and .....
9. Animals can blend in with their surrounding environments to hide from their ..... and preys through ..... property.

7 Give reasons for :

1. The starred agama lizard always looking for shade areas in desert.

.....

2. The penguin's body has a thick layer of fat and dense feathers.

.....

3. The blood vessels in the penguin's feet weave around each other.

.....

.....

4. Some desert lizards have colorful scales.

.....

5. Fennec fox has sandy-colored fur, while polar bear has a white fur. *(Minia 2023)*

.....

.....

6. Some animals have the ability to make camouflage adaptation.

.....

.....

8 What happens if ... ?

1. The warm blood vessels and cold blood vessels in the penguin's feet do not weave around each other.

.....

.....

2. The polar bear has thin fur instead of its thick fur.

.....

.....

3. The body of fennec fox is covered with black fur.

.....

.....

4. Some types of lizards are not able to make camouflage adaptation.

.....

.....

9 Compare between :

1.

Points of comparison	Penguin	Fennec fox
1. Habitat :	.....	.....
2. Body is covered with :	.....	.....

2.

Points of comparison	Polar bear	Forest bear
1. Habitat :	.....	.....
2. Fur is covered with :	.....	.....

10 Choose the animals that use camouflage adaptation to blend in with its environment :

a. Deer

b. Frog

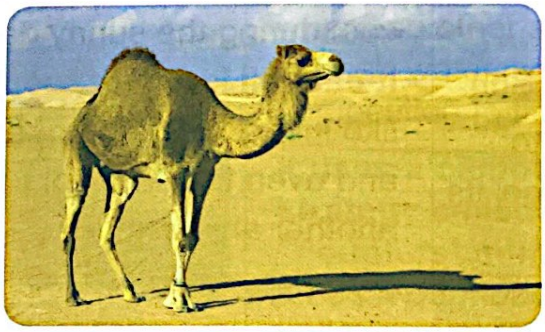
c. Cow

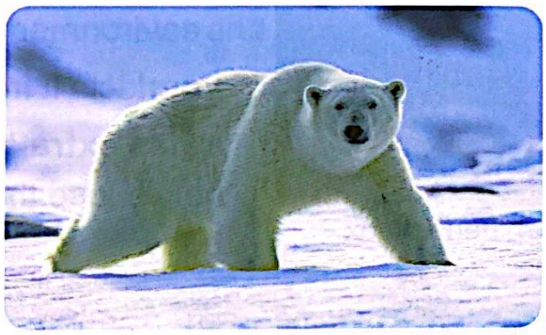
d. Lizard

LESSON TWO [Part A]

Activity 4 Types of Adaptations

▸ **Look at the following pictures, then put (✓) or (✗) :**





1. Camel's body is covered with a special thick hairy skin to adapt to live in desert. ( )
2. Polar bear has thick white fur to adapt to live in forests. ( )

▸ **In this lesson, we will study types of adaptations and explore these types in some animals.**

Types of adaptations

1. Structural adaptation	2. Behavioral adaptation
Definition	
It is a change in the body structure of a living organism to help it survive.	It is a change in the behaviors or acts of a living organism to help it survive.
Examples	
• The blood vessels in the penguin's feet. • The thick fur of the polar bear.	• Desert lizard looks for shade during hot sunny days. • Migration of some animals towards certain regions.

▸ **Now, we will study types of adaptations in some different animals.**

special	خاص	change	تغير / تغيير	behavioral adaptation	تكيف سلوكى
thick hairy skin	جلد سميك مشعر	structural adaptation	تكيف تركيبى	migration	الهجرة

1 Fennec fox :

Habitat	Structural adaptation	Behavioral adaptation
Hot dry desert  Fennec fox	- **It has a tan-colored coat (sandy-colored fur) that :** • provides camouflage to hide in a sandy, rocky environment. • protects it from the hot Sun. - **It has extra-large ears** to help it lose the heat to cool its body.	- **It pants like dogs** to cool its body, where it takes up to 700 breaths per minute. - **It lives in burrows** to stay cool during the sunny days. - **It eats all kinds of food** like insects, fruit, plant roots and even the remains from another animal's prey.

2 Arctic fox :

Habitat	Structural adaptation	Behavioral adaptation
Tundra desert with temperature as cold as (50°C) below zero in the winter months.  Arctic fox in winter  Arctic fox in summer	- **It has a thick fur coat** to keep its body warm in extreme cold climate. - **Its fur coat is white during winter but turns brown in summer when the snow melts** to help it sneak up on prey in any season. - **It has short ears and legs** to help it stay warm.	- **It lives in burrows** to stay warm at night. - **It eats all kinds of food** like insects, fruit, plant roots and even the remains from another animal's prey.

Note

The special shape of ears in both fennec and arctic foxes allow excellent hearing to help them hunt.

Give reason for ...

Both fennec fox in hot dry desert and arctic fox in cold tundra eat all kinds of food.
Because it is hard to find food in the hot dry desert and in the cold tundra.

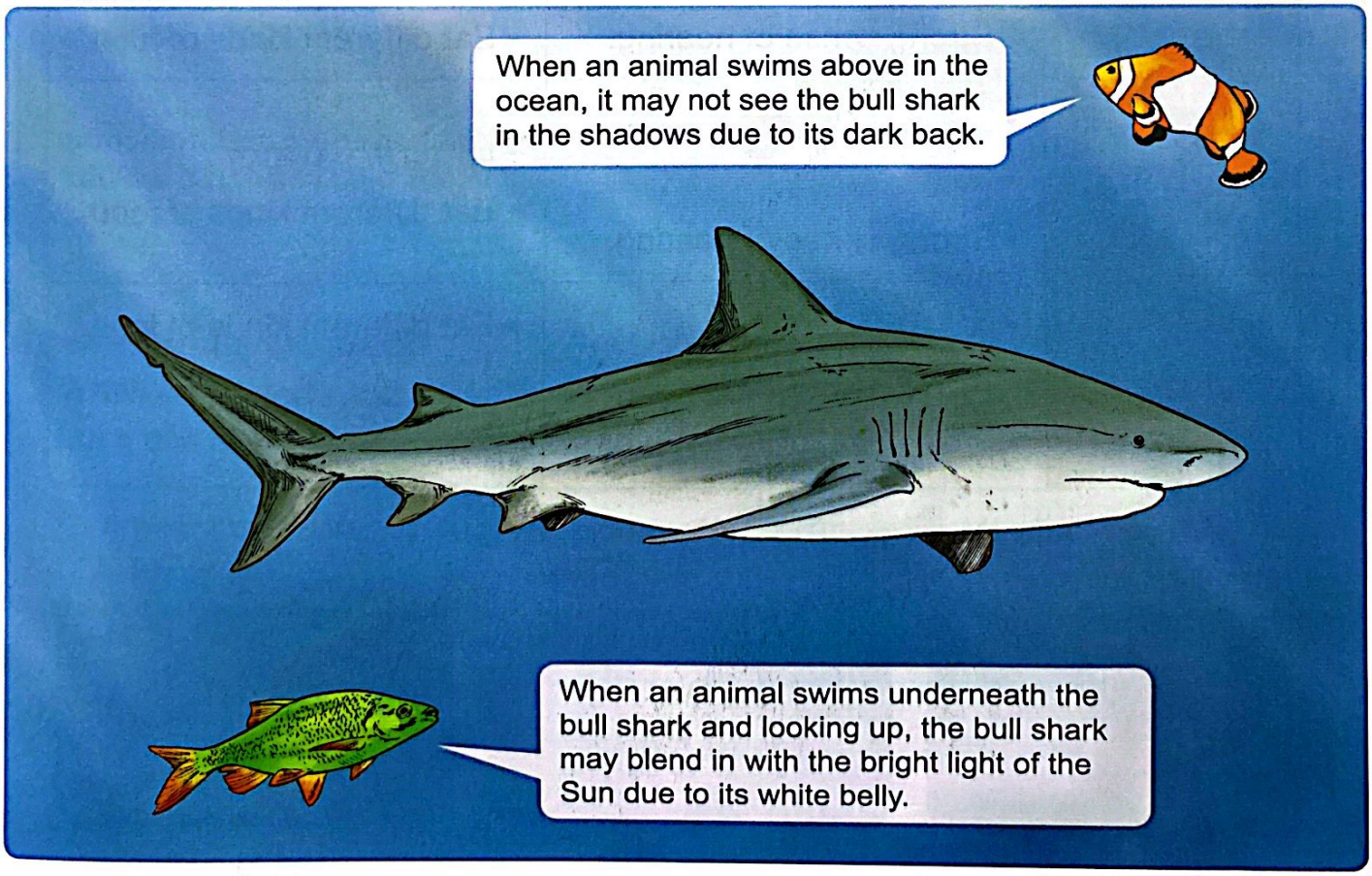
provide	يزود	burrows	جحور	arctic fox	الثعلب القطبى
pant	يلهث	remains	بقايا	tundra desert	صحراء التندرا

3 Bull shark :

▶ **Most sharks can live only in salt water but in bull sharks, their bodies have adapted to live in both fresh water and salt water.**

Habitat	Structural adaptation	Behavioral adaptation
Fresh water and salt water.  Bull shark	- **Its body is adapted to survive in fresh water,** where no other sharks live in fresh water, so it has less competition to find food. - **It uses a camouflage strategy called "countershading"**, where it has a dark back and white belly to sneak up on prey. - **It has sharp teeth** to cut its prey's flesh.	- **It eats different types of food** as it lives in both fresh water and salt water. - **It hunts during the day and at night,** so it can surprise its prey.

Countershading in bull shark :



bull shark	قرش الثور	competition	منافسة	belly	بطن
fresh water	مياه عذبة	sharp teeth	أسنان حادة	shadow	ظل
salt water	مياه مالحة	countershading	التباين اللونى	underneath	تحت

Check your understanding

▸ Write the scientific term :

1. It is a change in the body structure of a living organism to help it survive.

(.....)

2. It is a change in the behaviors or acts of a living organism to help it survive.

(.....)

▸ Use the following structural and behavioral adaptations of the following animals to complete the table below :

Hunts in day and night – Tan-colored coat – Panting – Sharp teeth – Short ears and legs – Big ears – Can live in fresh water – Camouflage by season – Countershading.

Animals	Structural adaptation	Behavioral adaptation
Fennec fox :	• ..... • ..... • Strong sense of hearing.	• ..... • Living in a burrow. • Eat different kinds of food.
Arctic fox :	• ..... • ..... • Strong sense of hearing.	• Living in a burrow. • Eat different kinds of food.
Bull shark :	• ..... • ..... •	• Eat different kinds of food. • .....

Activity 5 The Panther Chameleon

- **Lizards** are from **reptiles** that are an ancient type of animals found all over the world in different environments.
- Bodies of reptiles are covered with **scales** such as starred agama lizard and panther chameleon.

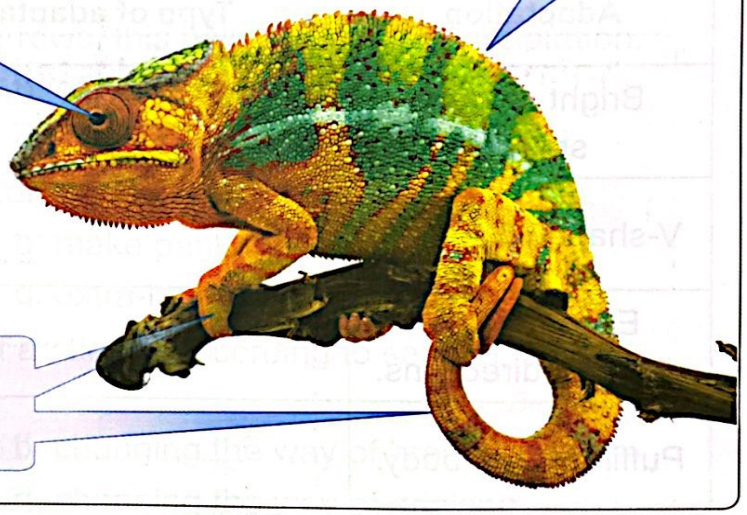
Adaptation of the panther chameleon to survive in its environment :

- **Habitat :**
  Tropical rainforest.

- **Structural adaptation :**

Chameleon has brightly colored scales to help it make camouflage and hide between green leaves and colorful flowers.

Chameleon eyes can face opposite directions, where each eye can move independently from the other, so :
- One eye can search for food like insects, while the other eye looks out for danger in a different direction.



Chameleon has V-shaped feet and a tail like a hand to hold tightly the branches of trees.

- **Behavioral adaptation :**
  - When chameleon finds itself in danger, it doesn't have teeth or claws for defense, but it can scare its enemies by some other tricks such as :

1. **It puffs up its body with air.**

2. **It opens its mouth wide.**

3. **It changes the colors of its scales.**

lizards	السحالى	hold tightly	تمسك بإحكام	scare	خوف
reptiles	الزواحف	last trick	الحيلة الأخيرة	puff up	ينتفخ
panther chameleon	حرباء النمر	tropical rainforest	الغابات الاستوائية المطيرة	claws	مخالب
independently	بشكل مستقل				

Give reason for ...

The panther chameleon can hunt its prey and avoid becoming a prey at the same time.

Because it can search for food with one eye, while its other eye looks out for danger in a different direction.

Check your understanding

▸ **Complete the following table which describes the types of adaptations that help chameleon to survive [put (s) for structural and (B) for behavioral] :**

Adaptation	Type of adaptation	This adaptation helps chameleon to .....
Bright colored scales.	.....	Camouflage to hunt and hide.
V-shaped like feet.	.....	Balance and move.
Eyes move in different directions.	.....	Hunt.
Puffing up its body.	.....	Scare its enemies.
Changing colors.	.....	Defend or survive.

balance توازن | hunting الصيد | defend يدافع

Exercises on Lesson 2 (Part A)

Understand Apply Higher Thinking Skills

1 Choose the correct answer :

1. The color of fur of fennec fox protects it from .....
   a. wind. b. rains.
   c. hot climate. d. cold weather.
2. Fennec fox has a tan-colored coat that provides ..... in its environment.
   a. camouflage b. respiration
   c. panting d. communication
3. Panting in fennec fox belongs to ..... adaptation. *(Fayoum 2022)*
   a. only structural b. only behavioral
   c. both structural and behavioral d. neither structural nor behavioral
4. Fennec fox and arctic fox live in burrows, this belongs to ..... adaptation.
   a. only structural b. only behavioral
   c. both structural and behavioral d. neither structural nor behavioral
5. All of the following properties help fennec fox to stay cool, except .....
   a. thick fur coat. b. make panting.
   c. tan-colored coat. d. extra-large ears.
6. Changing the color of body coat of arctic fox according to season, is considered as a type of ..... *(Beni-Suef 2023)*
   a. behavioral adaptation. b. changing the way of breathing.
   c. structural adaptation. d. changing the way of drinking.
7. All of the following properties help arctic fox to stay warm, except .....
   a. thick fur coat. b. short ears.
   c. tan-colored coat. d. short legs. *(Qena 2022)*
8. Both fennec fox and arctic fox are similar in all of the following, except .....
   a. they live in the same habitat.
   b. they can eat different things.
   c. they have excellent hearing ability.
   d. they have different sized ears.
9. All of the following sentences represent the meaning of adaptation, except .....
   a. it is the characteristic that helps living things survive.
   b. it is the characteristic that helps living things reproduce.
   c. it is the change that helps the animal to find a prey.
   d. it is the change that causes the death of the animal.

10. Bull sharks can live in ..... *(Giza 2023)*
    a. fresh water only.
    b. salt water only.
    c. seas, rivers and mud.
    d. rivers, seas and oceans.
11. One of structural adaptations of bull sharks is that they .....
    a. can live in both salt water and fresh water.
    b. are flexible about what they eat.
    c. hunt in the day as well as the night.
    d. can live in salt water only.
12. When a panther chameleon stands within leaves of trees, the color of its scales changes into ..... color.
    a. white
    b. green
    c. blue
    d. black
13. Special eyes of the panther chameleon belong to ..... adaptation.
    a. only structural
    b. only behavioral
    c. both structural and behavioral
    d. neither structural nor behavioral
14. ..... is considered as a behavioral adaptation in the panther chameleon. *(Giza 2023)*
    a. Puffing up its body during danger
    b. Each eye can move independently
    c. V-shaped feet
    d. Tail like a hand
15. All the following are structural adaptations in the panther chameleon, except .....
    a. each eye can move independently.
    b. openning its mouth wide during danger.
    c. its V-shaped feet.
    d. its tail like a hand.

2 Choose from columns (B) and (C) what suit them in column (A) :

(A) Animal	(B) Adaptation	(C) Helps it to ...
1. Chameleon	a. short ears and legs	A. stay cool
2. Fennec fox	b. V-shaped feet	B. stay warm
3. Arctic fox	c. different body colors	C. balance and move
4. Bull shark	d. panting	D. hide from its prey

1. ..... → ..... 2. ..... → ..... 3. ..... → ..... 4. ..... → .....

3 Put (✓) or (✗) :

1. Living organisms can adapt their environmental conditions through structural adaptation and behavioral adaptation. *(Menofia 2022)* ( )
2. The behavioral adaptation is a change in the body structure of a living organism to survive. *(Damietta 2023)* ( )
3. When the snow melts in polar regions, the thick fur coat of arctic fox turns black. ( )
4. The ears of arctic fox are larger than those of fennec fox. *(Sohag 2023)* ( )
5. Fennec fox stays in burrows during day, while arctic fox stays in burrows at night. ( )
6. Both fennec and arctic foxes can eat insects, fruit, plant roots and the remains from other animal's prey. ( )
7. Fennec fox has sandy-colored fur to help it make camouflage. ( )
8. Arctic fox lives in tundra, while fennec fox lives in hot desert. ( )
9. Panting and staying in burrows are considered behavioral adaptations in fennec fox. ( )
10. All types of sharks live in fresh water. *(North Sinai 2023)* ( )
11. If a bull shark moves from a river to a sea, it will die. ( )
12. Bull shark uses countershading camouflage to sneak up on its prey. ( )
13. Chameleon uses its tail and V-shaped feet to hunt and move. ( )
14. The panther chameleon has teeth and claws, through which it can hunt and eat its prey. ( )
15. Starred agama lizard use one of its eyes to search for food and the other one to look out for danger. ( )

4 Complete the following table :

Animal	Its adaptation	Structural or Behavioral adaptation
1.	Has blood vessels weave around each other.	.....
2. Polar bear	Has thick white fur.	Structural
3. ..... fox	Changes the color of its fur.	.....
4. ..... fox	Hiding inside burrows to stay cool.	.....
5. Panther chameleon	Has eyes face opposite directions.	.....

5 Write the scientific term of each of the following :

1. A change in the body structure of a living organism to survive. (.....)
2. A change in the behaviors or acts of a living organism to survive. (.....)
3. A type of foxes has a tan-colored fur. *(Behiera 2023)* (.....)
4. A way by which fennec fox cools itself like dogs. (.....)
5. A type of foxes that changes its fur color between winter and summer seasons. (.....)
6. A lizard that has different bright colored scales to provide camouflage in its environment and has V-shaped feet. (.....)
7. A shape of feet by which a panther chameleon holds tightly to branches of trees. (.....)
8. A feature in the bull shark, in which the upper surface of its body is darker than its lower surface. (.....)

6 Complete the following sentences :

1. Weaving of blood vessels around each other in penguin's feet is considered ..... adaptation, while migration of birds to certain regions is considered ..... adaptation. *(Assiut 2022)*
2. Tan-colored coat in fennec fox is considered ..... adaptation, while its panting to stay cool is considered ..... adaptation. *(Cairo 2023)*
3. Among animals that live in hot environments are ..... foxes, while ..... foxes live in cold environments.
4. Extra-large ears allow heat to escape to cool the bodies of ..... foxes, while short ears and legs help the ..... foxes stay warm.
5. Short ears of arctic fox is considered ..... adaptation, while its staying in burrows to be warm is considered ..... adaptation. *(Qena 2023)*
6. A burrow is an excellent place for the ..... fox to stay warm at night and for the ..... fox to stay cool during the day.
7. The fur color of arctic fox is ..... in winter but turns ..... in summer.
8. The chance of bull shark to find a prey is more easier in ..... water than in ..... water.
9. Countershading strategy of the bull shark is considered ..... adaptation.
10. Eyes of chameleon move independently of each other, this is considered as ..... adaptation. *(Behira 2022)*

11. Chameleon puffs up its body with air for defense which is considered ..... adaptation, while its V-shaped feet is considered ..... adaptation.

(Giza 2023 / Cairo 2023)

7 Give reasons for :

1. Fennec fox has a tan-colored coat.

.....

2. Fennec fox undergoes panting.

.....

3. Arctic fox has a thick fur coat.

.....

4. The fur of arctic fox is white during winter but it turns brown in summer.

.....

5. Burrows are excellent places for arctic and fennec foxes.

.....

.....

6. Fennec fox has extra-large ears, while arctic fox has short ears. *(Menofia 2023)*

.....

.....

7. Bull sharks have less competition for finding food in fresh water.

.....

8. Panther chameleon has V-shaped feet and a long tail. *(Assiut 2023)*

.....

8 What happens if ... ?

1. Arctic fox has a brown coat during winter but it turns white during summer.

.....

2. Fennec fox has short ears.

.....

3. Sense of hearing becomes weak in foxes.

.....

4. Arctic fox has only a white coat during all seasons of the year.

.....

5. Both eyes of panther chameleon move in one direction only.

.....

6. Panther chameleon is exposed to danger.

.....

9 Cross out the odd word :

1. Penguin – Polar bear – Fennec fox – Arctic fox. *(Sohag 2023)* (.....)
2. Fennec fox – Starred agama lizard – Panther chameleon – Bull shark. (.....)
3. Panther chameleon – Polar bear – Fennec fox – Arctic fox. (.....)

10 Compare between :

Points of comparison	Fennec fox	Arctic fox
1. Habitat :	.....	.....
2. Color of fur :	.....	.....
3. Shape of ears :	.....	.....
4. Time of hiding in burrows :	.....	.....

11 Put (S) in front of structural adaptation and (B) in front of behavioral adaptation for each of the following statements :

1. Tan-colored coat of fennec fox. (.....)
2. Living of the arctic fox in burrows. (.....)
3. Living of bull shark in both salt water and fresh water. (.....)
4. Countershading of bull shark. (.....)
5. V-shaped feet of panther chameleon. (.....)
6. Change the colors of panther chameleon scales in danger cases. (.....)

12 Give only one example of behavioral adaptation in each of the following animals :

1. Fennec fox : .....
2. Starred agama lizard : .....
3. Bull shark : .....
4. Panther chameleon : .....

13 Look at the following figures, then answer the questions :

Figure (1)

Figure (2)

1. What is the name of this animal and where does this animal live ?

.....

2. Figure (1) represents this animal in ..... season, while figure (2) represents this animal in ..... season.

3. Why does the fur color of this animal change between summer and winter seasons ?

.....

4. Mention one structural adaptation and one behavioral adaptation in this animal to adapt and survive in its environment :

- Structural adaptation :

.....

- Behavioral adaptation :

.....

LESSON TWO [Part B]

Activity 6 Plant Adaptations

Palm tree

▸ **Look at the opposite picture, then put (✓) or (✗) :**

1. Palm tree is adapted to grow and survive in rainforest habitat. ( )
2. Plants have adaptations like animals to be able to survive in different environments. ( )

- Plants can grow in every place that sunlight shines, even the bottom of sea ice in polar regions has tiny plants growing on it.
- Like animals, plants have structural and behavioral adaptations that help them survive and grow in their different environments.

▸ **Now, we will study two different big trees that grow in two different environments which are Savannah and Amazon rainforest.**

Savannah

Such as **Southern African Savannah.**

- It is a **grassland** habitat with a **mild** temperature.
- It is characterized by **extreme lack of water** during the dry season.
- Acacia tree is a big tree that grows in Savannah.
- Most large plants cannot grow in this habitat due to drought conditions, as the dry season lasts half of the year.

Amazon rainforest

Such as **Amazon rainforest of Brazil.**

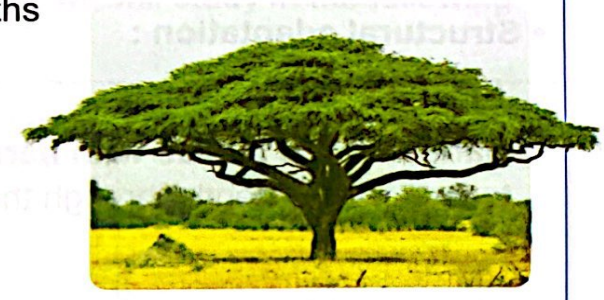
- It is rainy most of the year, so it is **easy to find water.**
- It is characterized by **strong winds.**
- Kapok tree is a big tree that grows in Amazon rainforest.
- It is hard for some plants in this habitat to reach sunlight due to the extra tall trees growing up to 70 meters tall.

savannah	السافانا	drought conditions	ظروف الجفاف	strong winds	رياح شديدة
Amazon rainforest	غابات الأمازون المطيرة	lack of water	نقص المياه	mild temperature	درجة حرارة معتدلة
kapok tree	شجرة الكابوك	acacia tree	شجرة السنط	scatter	مُبعثر
grassland	المراعى				

Adaptation of the two different big trees to survive in their different environments :

1 Acacia tree (umbrella-shaped tree)

• Acacia is adapted to survive through many months of drought in its environment as follows :



Acacia tree

• **Habitat :**

Southern African Savannah.

• **Structural adaptation :**

Leaves

- **Tiny leaves grow on the top of the tree** to help them hold in water, while soaking up (absorbing) sunlight needed to make food.
- **There are sharp spines around the leaves** to prevent animals from eating these leaves.

Leaves of Acacia tree

Trunk

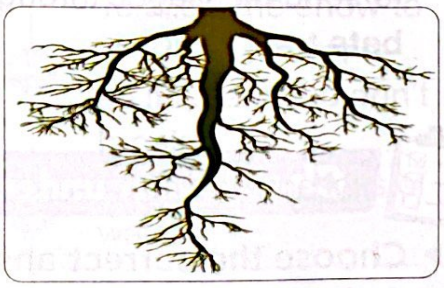
- **A very long trunk,** so most animals except **giraffe** cannot reach its leaves to feed on.

Note

The trunk in acacia tree stores water as the hump in the camel stores fat.

Root

- **A very long root called taproot** that grows directly downward to search for water as deep as 35 meters below the soil surface.



Taproot

• **Behavioral adaptation :**

Acacia tree can defend itself as follows :

- It **produces a poison** when an animal begins eating its leaves to make the leaves taste very bad to keep this animal away.
- It **sends a smelly message in the wind** to warn other acacia trees nearby telling them to start making the same poison.

tiny leaves	أوراق صغيرة	soak up	يمتص	hump	سنام
sharp spines	أشواك حادة	trunk	جذع	taproot	جذر رئيسى
send	يرسل	produce	ينتج	poison	سم
nearby	بالقرب من	smelly message	رسالة ذات رائحة		

2 Kapok tree (umbrella-shaped tree)

Kapok tree

- Kapok is adapted to survive in its environment through structural and behavioral adaptations as follows :
- **Habitat :** Amazon rainforest of Brazil.
- **Structural adaptation :**

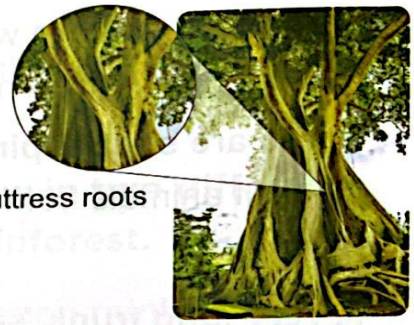
Leaves

Hand-shaped leaves with narrow parts to allow wind to move more gently through the leaves without tearing them.

Kapok leaves

Roots

- **Large, wide roots** called buttress roots.
- Buttress roots are not planted deeply in the ground but they grow high up on its trunk to hold the tree firmly in the **soggy soil (wet muddy soil)**.



Buttress roots

Kapok tree

Note

Buttress roots can start up to 5 meters above the ground.

Seeds

- Kapok tree has **fluffy yellow seeds** to be easily carried by wind across the forest.

Kapok flowers and seeds

- **Behavioral adaptation :**
  - Kapok tree has **delicious-smelling flowers** to send messages through wind to attract **bats** towards it.

Check your understanding

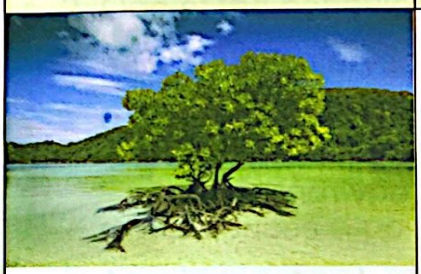
Choose the correct answer :

1. Sending a smelly message from acacia tree to warn other acacia trees is considered ..... adaptation.
   a. only structural
   b. only behavioral
   c. both structural and behavioral
   d. neither structural nor behavioral
2. A structural adaptation of kapok tree is that .....
   a. it has delicious-smelling flowers.
   b. it has buttress roots.
   c. it has sharp spines around its leaves.
   d. it has a long taproot.

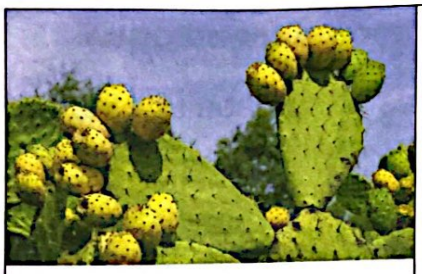
narrow parts	الأجزاء الضيقة	delicious-smelling flowers	زهور ذات رائحة طيبة	soggy soil	تربة رطبة
buttress roots	جذور داعمة			firmly	بحزم
fluffy	رقيق	gently	بلطف		

Activity 7 Plant Scientist

- The scientist who studies plants is known as "botanist".
- Plants have different properties that help them to adapt and survive in their different environments through their structural adaptations as we will study in the following examples :

Plant	Habitat	Structural adaptation	Reason
 Mangrove tree	Salt water	It has long and strong roots.	To resist the water waves.
 Water lily	Wetland (Fresh water)	It has wide floating leaves.	To absorb a large amount of sunlight.
 Pine tree	Snow	**The pine tree has :** - a triangular shape and short branches. - needle leaves.	- To allow the snow to slide easily over it, so its branches don't break. - To prevent the loss of water.
 Palm tree	Desert	- It has thick roots and small leaves.	To resist the strong winds.

botanist	عالِم النبات	pine tree	شجرة الصنوبر	wetland	أرض رطبة
resist	يقاوم	mangrove tree	شجرة المانجروف	palm tree	شجرة النخيل
water lily	زنبق الماء / اللوتس	water waves	أمواج الماء	needle leaves	أوراق إبرية

 Barbary fig	Desert	It has sharp spines and tough outer cover.	To prevent animals from eating its leaves and fruits.

▸ From the previous table, we can conclude that :

- All plants have roots, stems (trunks) and leaves.
- Plants differ in the structure and shape of their roots, stems and leaves to adapt the environmental conditions to survive and grow in their environments.

What happens if ... ?

Plants were placed in different environment.

These plants may die or may adapt the new environmental conditions to survive and grow in their new environments.

Check your understanding

▸ Put (✓) or (✗) :

1. Palm tree has short roots and big leaves. ( )
2. Water lily plant lives in salt water. ( )
3. Mangrove tree has long and strong roots to help the plant to resist the water waves. ( )

In the Assessment Book :
Try to answer :
Self-Assessment (2)

barbary fig	تين شوكى	prevent	يمنع
environmental conditions	الظروف البيئية	tough outer cover	غطاء خارجى متين

Exercises on Lesson 2 (Part B)

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. It is difficult for rainforest plants to get .....
   a. water. b. air.
   c. sunlight. d. oxygen.
2. One of the behavioral adaptations of acacia tree is that ..... *(Alex. 2023)*
   a. it has one very long root.
   b. it has sharp spines around its leaves.
   c. it has very tall trunk.
   d. it produces a poison to make bad tasty leaves.
3. Acacia tree trunk and camel hump, ...
   a. both store water.
   b. both store fat.
   c. the first stores fat and the second stores water.
   d. the first stores water and the second stores fat.
4. All of the following properties protect acacia leaves from being eaten by animals, except that ..... *(Minia 2022)*
   a. they are high enough. b. they are surrounded by sharp spines.
   c. they are brightly colored. d. they produce a poison.
5. The acacia tree warns the other nearby acacia trees from animals by sending .....
   a. a watery message in the air. b. a watery message in the water.
   c. a smelly message in the air. d. a smelly message in the water.
6. When the nearby acacia trees receive the smelly message from the acacia tree, which exposed to be eaten by animals, they start to .....
   a. lose water from their trunks.
   b. invite bats to eat their leaves.
   c. make a poisonous substance in their leaves.
   d. fall down their leaves.
7. Savannah is characterized by all of the following, except .....
   a. it is a grassland habitat. b. it is rainy most of the year.
   c. it has a mild temperature. d. it has extreme lack of water.

8. From umbrella-shaped trees are ..... *(Cairo 2023)*
   a. mangrove tree and acacia tree. b. mangrove tree and kapok tree.
   c. acacia tree and kapok tree. d. barbary fig and water lily.
9. The roots of kapok tree are not planted deeply in the soil, because .....
   a. the soil contains less water. b. the soil contains more water.
   c. the climate is very cold. d. the climate is very hot.
10. Kapok tree uses the wind to carry its fluffy yellow seeds across its .....
   a. desert habitat. b. snowy habitat.
   c. salt water habitat. d. rainforest habitat.
11. If a plant grows in a dry desert, it needs ..... to adapt for getting water.
   a. long branches b. long leaves
   c. long roots d. more sunlight
12. If a plant grows in a rainforest, where it is hard to reach sunlight, so it needs ..... to adapt for getting more sunlight.
   a. small roots b. a very tall trunk
   c. sharp spines d. a very short trunk
13. If a plant grows in a snow habitat, so it needs all of the following characteristics, except ..... to adapt this habitat.
   a. short branches b. triangular shape
   c. needle leaves d. wide leaves
14. All of the following are adaptations of different plants to keep animals away from them, except that they .....
   a. produce poison.
   b. gather their branches high above.
   c. have delicious-smelling flowers.
   d. have sharp spines.
15. Desert plants are characterized by all of the following, except that they .....
   a. store water. b. have wide leaves.
   c. have long roots. d. have sharp spines.
16. Palm tree has tiny leaves like .....
   a. pine tree. b. kapok tree.
   c. acacia tree. d. water lily plant.
17. One of the structural adaptations of water lily plant is that ..... *(Giza 2022/2023)*
   a. it has long roots. b. it has sharp spines.
   c. it has tiny leaves. d. it has wide leaves.

18. Mangrove tree has long and strong roots to ..... *(Sharkia 2023)*
    a. resist the strong wind. b. resist the water waves.
    c. prevent the loss of water. d. absorb the underground water.
19. Pine tree has a triangular shape to make snow slides over its branches without breaking it. This structural adaptation makes this tree face the extreme cold climate like the feet of .....
    a. caracal. b. penguin.
    c. fennec fox. d. brown bear.
20. Barbary fig keeps animals away like acacia trees by its .....
    a. sharp spines. b. poison.
    c. smell. d. long leaves.

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Long and strong roots	a. prevent animals from eating barbary fig.
2. Wide leaves	b. make mangrove tree resists the water waves.
3. Needle shaped leaves	c. carries the kapok tree's fluffy yellow seeds across the forest.
4. Sharp spines	d. allow wind to move more gently through the leaves of kapok tree.
5. Hand-shaped leaves	e. allow water lilies absorb large amount of sunlight.
	f. prevent the loss of water in pine tree.

1. ..... 2. ..... 3. ..... 4. ..... 5. .....

3 Put (✓) or (✗) :

1. Plants have structural adaptation only to help them survive and grow in different environments. *(Fayoum 2022)* ( )
2. The rain falls for 6 months in Southern African Savannah. ( )
3. The taproot of acacia tree grows deeply downward searching for water. ( )
4. Acacia leaves are protected from being eaten by animals as they have brightly colored leaves. ( )
5. Acacia tree and kapok tree use wind to send messages. ( )
6. Acacia tree has delicious-smelling flowers to attract bats towards it. ( )
7. Hand-shaped leaves of kapok tree is considered as a behavioral adaptation. *(Minia 2023)* ( )

8. Kapok tree produces fluffy yellow seeds, this is considered as a structural adaptation. ( )
9. One of the structural adaptations of acacia tree is that it has large, wide roots called buttress roots. *(Sohag 2023)* ( )
10. Mangrove trees adapt to resist the water waves through their long, strong roots. *(Sharkia 2022)* ( )
11. Water lily has wide leaves to absorb a large amount of sunlight. ( )
12. Pine trees that live in desert habitat have needle leaves to prevent the loss of water. ( )
13. Having thick roots is a behavioral adaptation of palm trees to resist strong winds. ( )
14. Animals can't eat barbary fig due to its sharp spines. ( )
15. Plants of dry desert habitat adapt to store water. ( )
16. Some plants have sharp spines to absorb a large amount of sunlight. ( )

4 Write the scientific term of each of the following :

1. A tree that grows in Southern African Savannah and it has sharp spines around its leaves. (.....)
2. A structural adaptation of acacia tree that allows it to search for water. (.....)
3. A structural adaptation that surrounds the leaves of acacia tree to prevent animals from eating them. (.....)
4. A tree that grows in Amazon rainforest of Brazil and it has hand-shaped leaves. (.....)
5. A structural adaptation that fixes the kapok tree in soggy soil and support its trunk. *(Red Sea 2023)* (.....)
6. The part of the kapok tree which is supported by the buttress roots. (.....)
7. A tree lives in salt water habitat and has long, strong roots to resist the water waves. (.....)
8. A plant lives in wetland habitat and it has wide leaves to absorb a large amount of sunlight. (.....)
9. A structural adaptation in water lilies that helps them absorb a large amount of sunlight. (.....)
10. A structure that prevents the loss of water in the pine tree. (.....)

5 Complete the following sentences :

1. Acacia tree defends itself by producing ..... that makes leaves taste terrible, while chameleon defends itself by puffing up its ..... with air.
2. Kapok tree grows in Amazon rainforest habitat which has ..... soil.
3. The hand-shaped leaves of kapok tree allow ..... to flow through them gently. *(Gharbia 2023)*
4. The kapok tree spreads the smell of its flowers to attract ..... towards it.
5. Among the plants that can survive in habitats that have lackage of water are ..... , ... and .....
6. The leaves of ..... tree in hot weather habitat store water, while the needle leaves of ..... tree in snowy habitat prevent the loss of water.
7. The leaves of water lilies are wide in order to ..... on the water surface and to absorb a large amount of ..... *(Ismailia 2022)*
8. Drought regions are characterized by lacking of ..... so, their plants adapt by having very long .....
9. The structural adaptation of ..... tree can resist water waves, while the structural adaptation of ..... tree can resist strong winds.
10. The leaves of ..... plant allow it to absorb a large amount of sunlight, while the leaves of ..... tree allow wind to move easily through these leaves without tearing them.

6 Give reasons for :

1. Branches of acacia tree gather on the top of its trunk.

.....

.....

2. Acacia tree has sharp spines around its leaves.

.....

3. Wind is important to acacia tree.

.....

.....

4. Kapok tree has hand-shaped leaves.

.....

.....

5. Kapok trees stay firmly rooted in the soggy soil although they are very tall.

.....

6. Pine tree has a triangular shape and short branches.

.....

7. Water lilies have wide floating leaves. *(Sharkia 2022)*

.....

8. Mangrove tree has long and strong roots. *(Cairo 2023)*

.....

9. Palm trees have thick roots and small leaves.

.....

10. Barbary fig has sharp spines. *(Sharkia 2023)*

.....

7 What happens if ... ?

1. The length of acacia taproot doesn't exceed 3 meters downward.

.....

2. The acacia leaves are not guarded by sharp spines.

.....

3. There are no buttress roots in the kapok tree.

.....

4. The pine tree has an umbrella shape not a triangle shape.

.....

.....

5. Some plants of rainforest habitat became very short.

.....

6. Water lily has narrow leaves instead of wide leaves.

.....

7. Palm tree has thin roots and large leaves.

.....

8 Cross out the odd word :

1. Taproot – Tiny leaves – Buttress roots – Producing a poison. (.....)
2. Taproot – Hand-shaped leaves – Soggy soil – Buttress roots. (.....)
3. Cactus plant – Barbary fig – Palm tree – Mangrove tree. (.....)
4. Acacia tree – Polar bear – Penguin – Pine tree. (.....)

9 Compare between :

1.

Points of comparison	Acacia tree	Kapok tree
1. Type of roots :	.....	.....
2. Shape of leaves :	.....	.....

2.

Points of comparison	Kapok tree	Water lily plant	Pine tree
1. Habitat :	.....	.....	.....
2. Shape of leaves :	.....	.....	.....

10 Classify the following living organisms according to their habitats into organisms live in deserts and organisms live in forests in the table below :

(Starred agama lizard – Panther chameleon – Fennec fox – Kapok tree – Palm tree – Barbary fig plant)

Organisms live in deserts	Organisms live in forests
.....	.....
.....	.....
.....	.....
.....	.....

LESSON THREE

Activity 8 Digestive System

▸ **Look at the following figures, then complete the sentences below :**

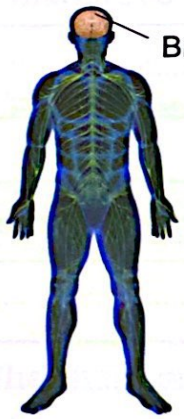


Figure (1)

Figure (2)

Figure (3)

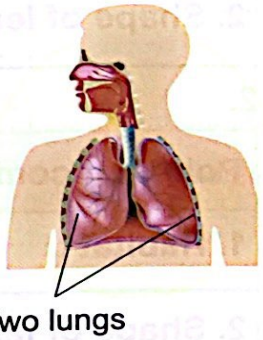


Figure (4)

1. Figure ..... represents the human digestive system.
2. Figure ..... represents the human respiratory system.

How do body systems adapt to meet the needs of living organisms ?

- Each living organism has different ways to adapt to live in its environment, so :

- The body of a living organism (human or animal) is made up of systems such as digestive system, respiratory system, nervous system, ... etc.

System :

It is a group of organs that work together to perform a specific job (function).

Note

Digestive system and respiratory system are working together to get energy from food and breathing.

▸ **In this lesson, we will study :**

- Human digestive system.
- Human respiratory system.
- Why do we need to eat food ?

"Because food contains different nutrients (Vitamins, proteins, .. etc.) that give us energy to :

- do activities as walking, talking and even during sleeping.
- do body function as heart beating, breathing and thinking.

brain	المخ	two lungs	الرئتين	energy	طاقة
stomach	المعدة	specific job	وظيفة محددة	breathing	تنفس
heart	القلب	digestive system	الجهاز الهضمى	nervous system	الجهاز العصبى
nutrients	العناصر الغذائية	organs	أعضاء	respiratory system	الجهاز التنفسى
heart beating	نبض القلب				

Note

In one day, your body needs a lot of energy, so :

- your heart beats around 100,000 times.
- you breathe over 20,000 times.

Human digestive system :

- The digestive system breaks down food into smaller parts that your body can use in a process called digestion process.

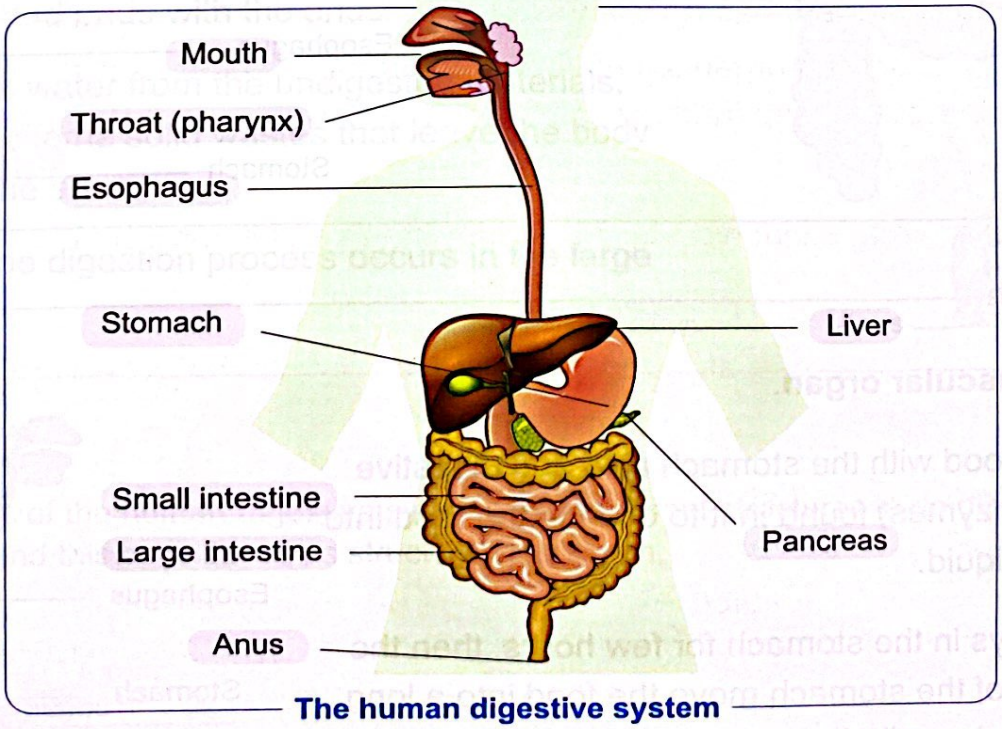
Digestion process :

It is a process of breaking down food into smaller parts that the body cells absorb and use them to get energy and grow.

The structure of the human digestive system :

The human digestive system consists of a group of organs that work together which are :

- Mouth
- Throat (pharynx)
- Esophagus
- Stomach
- Small intestine
- Large intestine



The human digestive system

Note

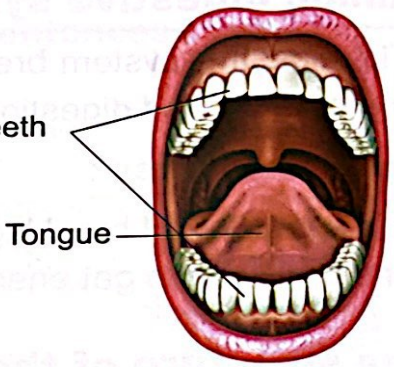
Digestive system starts with **mouth** and ends with **anus**.

digestion process	عملية الهضم	mouth	فم	liver	الكبد	large intestine	الأمعاء الغليظة
esophagus	المرئ	throat (pharynx)	البلعوم	pancreas	البنكرياس	anus	فتحة الشرج
body functions	وظائف الجسم	small intestine	الأمعاء الدقيقة				

Description and function of organs of human digestive system :

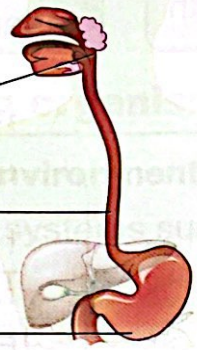
Mouth

- Digestion process begins in the **mouth**.
- **Mouth contains :**
  - **Teeth** : They crush food during chewing
  - **Saliva :** - It is a liquid substance in the mouth.
    - It moistens food and begins to break it down.
  - **Tongue :** It mixes food with saliva in the mouth.



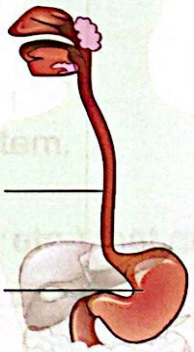
Esophagus

- It is **a long muscular tube**.
- It allows the food to move from throat down into the stomach.



Stomach

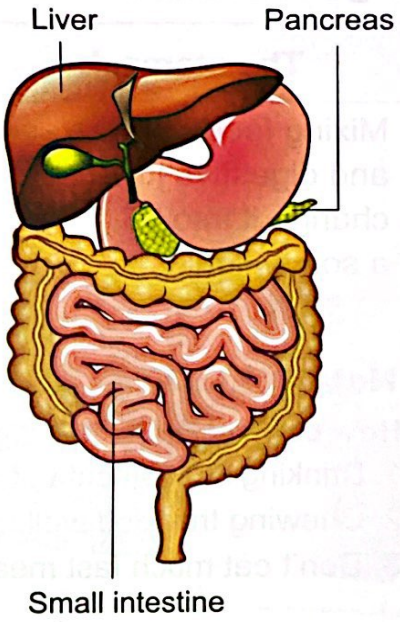
- It is **a muscular organ**.
- It mixes food with the stomach acid and digestive juices (enzymes) found in it to change the food into a soupy liquid.
- Food stays in the stomach for few hours, then the muscles of the stomach move the food into a long, winding tube called small intestine.



description	وصف	stomach acid	حمض المعدة	crush	سحق
saliva	اللُعاب	enzymes	أنزيمات	chew	مضغ
long muscular tube	أنبوب عضلى طويل	function	وظيفة	digestive juices	عصارات هضمية
muscular organ	عضو عضلى	substance	مادة	moisten	مُبلل

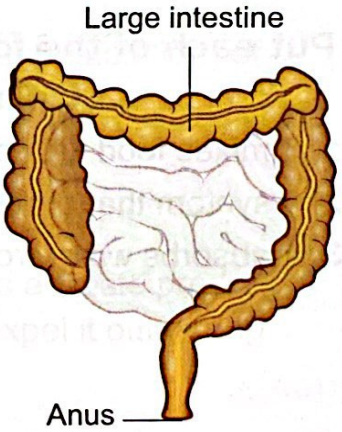
Small intestine

- It is **a long, winding tube** as its length is more than six meters.
- The juices of **pancreas** and **liver** flow into the small intestine and help in breaking down the food into nutrients (or digested food).
  - The walls of the small intestine absorb these nutrients through tiny blood vessels to carry them to all body parts.
- The body does not benefit from some parts of food known as undigested materials that flow into the large intestine.



Large intestine

- It is a tube that starts from the end of the small intestine and ends with the anus.
- It absorbs water from the undigested materials, so they become solid wastes that leave the body through the anus.
- There is no digestion process occurs in the large intestine.



Note

The organs of the human digestive system have different structures to do different functions and this considered as structural adaptation.

What happens if ... ?

One of the organs of the digestive system is absent.

The digestive system could not do its function correctly.

benefit	منفعة	undigested materials	مواد غير مهضومة	properties	خصائص
flow	تدفق	solid wastes	الفضلات الصلبة		

▶ **Comparison between the functions of the stomach, small intestine and large intestine :**

The stomach	The small intestine	The large intestine
Mixing food with the acid and digestive juices to change it into a soupy liquid.	Breaking down of food into nutrients by the help of the juices of liver and pancreas.	Absorbing the water from undigested materials.

Note

How can you keep the digestive system healthy ?

1. Drinking a lot amount of water.
2. Chewing the food well.
3. Don't eat much fast meals.

Check your understanding

▶ **Put each of the following words in front of its suitable sentence :**

(Stomach – Large intestine - Digestive system)

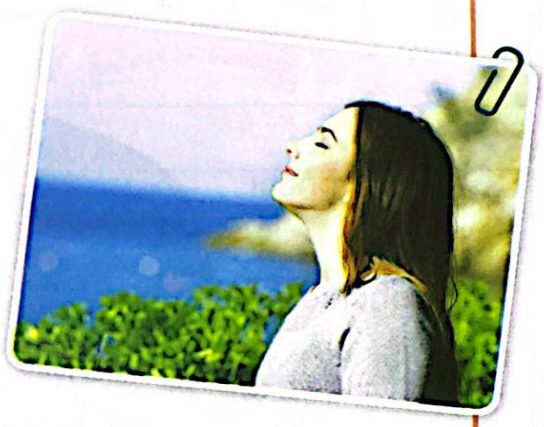
1. It mixes food with acid and digestive juices. (.....)
2. A system that breaks down food into smaller parts. (.....)
3. It absorbs water from the undigested materials. (.....)

take place يحدث | healthy صحى | fast meals وجبات سريعة

Activity 9 Respiratory System

Human respiratory system :

- Our bodies need oxygen in order to do their functions.
- We get oxygen gas from the air around us all the time.
- The respiratory system is the system responsible for breathing (respiration).
- The respiratory system supplies the body with oxygen gas and gets rid of carbon dioxide gas through the respiration process.



Respiration process :

It is a process of pulling air in (inhalation) and pushing air out (exhalation) of the body.

Note

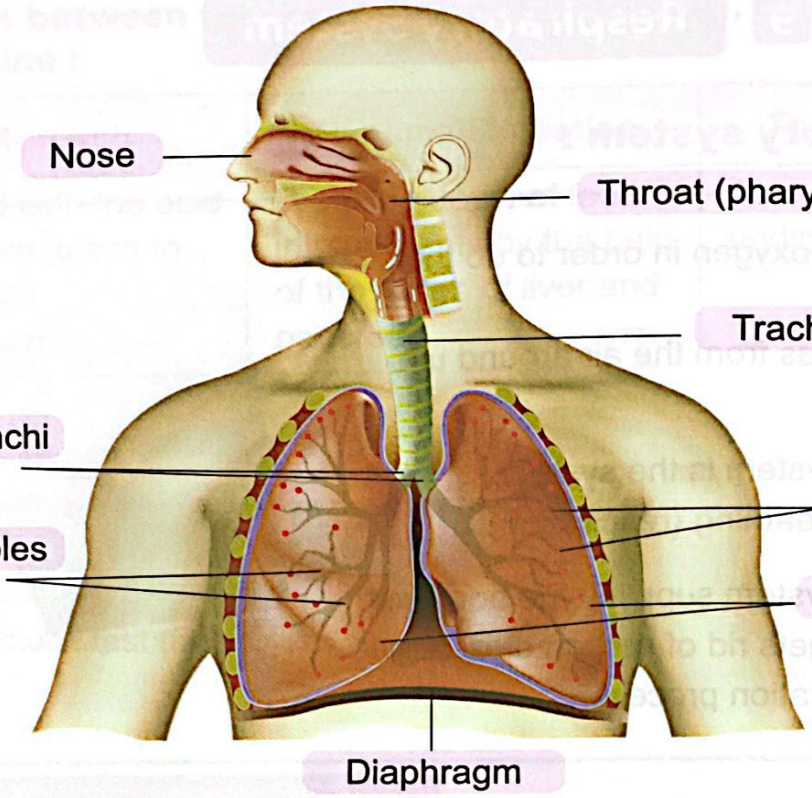
Carbon dioxide gas produced during respiration process is a waste product. carbon dioxide gas is harmful to our bodies so, we must expel it out during exhalation.

The structure of the human respiratory system :

The human respiratory system consists of a group of organs that work together which are :

- Nose
- Throat (pharynx)
- Trachea
- Two bronchi
- Two lungs
- Diaphragm

exhalation	زفير	trachea	القصبة الهوائية	expel out	يطرد
harmful	ضار	inhalation	شهيق	two bronchi	الشعبتان الهوائيتان
nose	أنف	get rid of	يتخلص من	diaphragm	الحجاب الحاجز



The human respiratory system

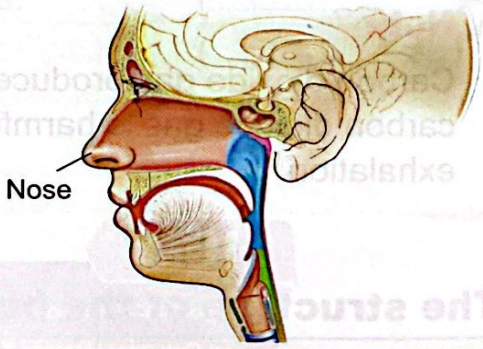
How does the respiratory system work ?

Nose :

It is the first organ of the respiratory system through which the air enters the body.

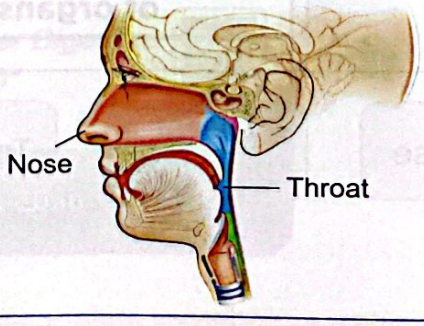
Note

The air can enter the body through the nose and the mouth.



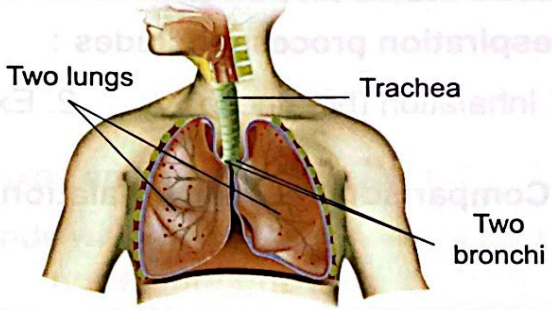
Throat :

It allows the air to pass from the nose to the "trachea"



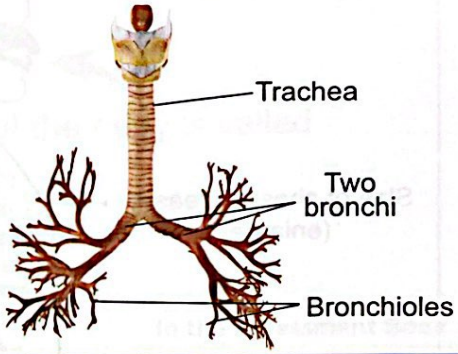
Trachea :

- It is a tube that allows air to pass into the "two lungs" which fill up with air like two balloons.
- Inside the lungs, the trachea is branched into two tubes known as "two bronchi"



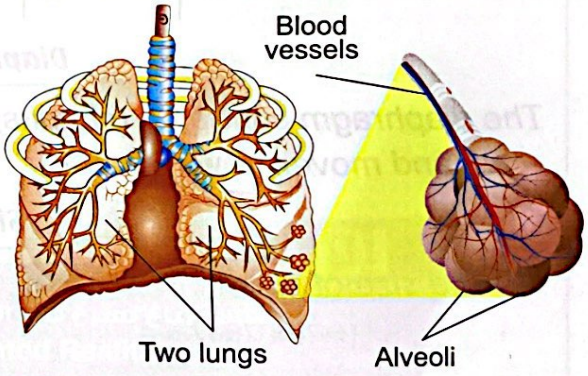
Two bronchi :

- They allow the air to enter the two lungs.
- They are divided into smaller and smaller tubes that look like the branches of a tree known as "bronchioles".



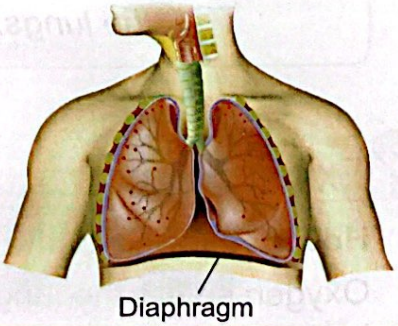
Two lungs :

- Inside the lungs, the bronchioles end with little air sacs, surrounded by blood vessels known as "alveoli".
- Inside the blood vessels, oxygen moves into the blood which carries oxygen around the body to help other organs and systems to work.



Diaphragm :

- It is a large muscle at the base of ribs which plays an important role in inhalation and exhalation.



Note

The organs of the human respiratory system have different structures to do different functions and this is considered as structural adaptation.

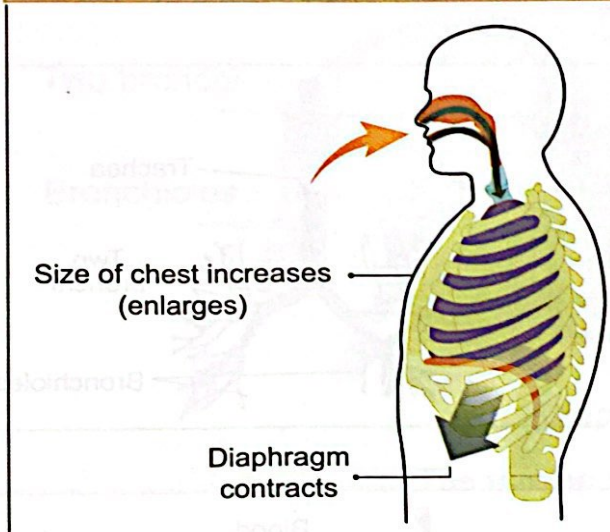
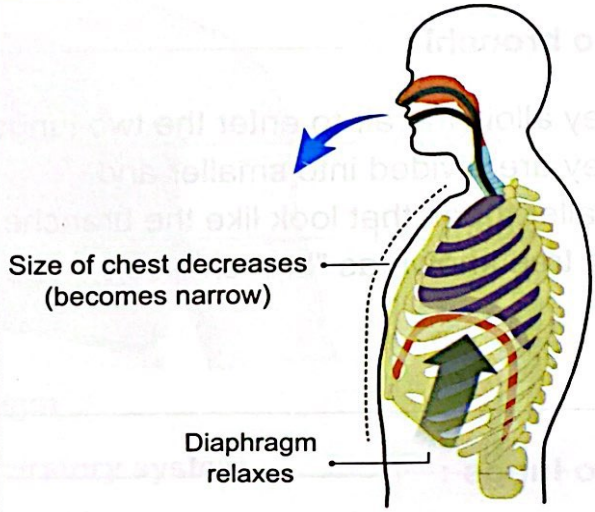
fill up تملأ | look like يشبه

How does the respiration process take place ?

Respiration process includes :

1. Inhalation (breathe in). 2. Exhalation (breathe out).

▸ **Comparison between inhalation and exhalation :**

During inhalation	During exhalation
	
Diaphragm muscle	
The diaphragm contracts (shrinks) and moves downward.	*The diaphragm relaxes (expands) and moves upward.*
Size of chest	
The size of chest increases (enlarges).	*The size of chest decreases (becomes narrow).*
Type of air	
The air rich in oxygen gas enters the lungs.	*The air rich in carbon dioxide gas is expelled out of the lungs.*

Explain ?

How does the respiratory system get oxygen to the body cells ?

Oxygen enters the lungs during inhalation, then the blood carries oxygen to all the body cells.

chest	صدر	contract (shrink)	يتقلص
expand	يتمدد	relax	يسترخى

Check your understanding

▸ Put (✓) or (✗) :

1. During inhalation, the diaphragm muscle relaxes and moves downward. ( )
2. Respiration process starts with mouth and ends with anus. ( )

.....

▸ Complete :

1. Respiration process includes ..... and .....
2. The process of pulling air in and pushing air out of the body is called ..... process.

In the Assessment Book :
Try to answer :
Self-Assessment ③

inhalation	شهيق	pulling air in	سحب الهواء إلى الداخل	pushing air out	دفع الهواء للخارج	59

Exercises on Lesson 3

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. The energy that the living organism needs to perform different functions is obtained from .....
   a. breathing only.
   b. food processing only.
   c. breathing and running.
   d. breathing and food processing.
2. All of the following are organs of the digestive system, except .....
   a. mouth. b. nose. c. stomach. d. esophagus.
3. Digestion process begins in the ..... *(Giza 2023)*
   a. stomach. b. esophagus. c. mouth. d. small intestine.
4. Which of the following organs does not share in breaking down of food ? .....
   a. Mouth. b. Stomach. c. Lungs. d. Small intestine.
5. Crushing the food in your mouth is the function of ..... *(Behira 2022)*
   a. stomach. b. tongue. c. saliva. d. teeth.
6. All of the following are correct about the mouth, except .....
   a. it is the first organ in the digestive system.
   b. it has teeth. c. it has tongue.
   d. it moves directly food to the stomach.
7. Saliva in the mouth makes the food become soft and mushy with the help of .....
   a. teeth only. b. tongue only.
   c. teeth and esophagus. d. teeth and tongue.
8. The throat is connected to the stomach through .....
   a. esophagus. b. trachea. c. small intestine. d. large intestine.
9. The organ that moves the food into the stomach is ..... *(Alex. 2023)*
   a. mouth. b. tongue. c. esophagus. d. small intestine.
10. The food passes from the stomach to the ..... directly.
    a. esophagus b. small intestine c. large intestine d. anus
11. The stomach mixes the food with ..... to help in digestion of food.
    a. digestive juices only b. stomach acid only
    c. saliva and digestive juices d. stomach acid and digestive juices

12. The liver and ..... pour their juices into the small intestine.
    a. throat b. esophagus c. large intestine d. pancreas
13. The long winding tube that its length is about more than six meters is called .....
    a. large intestine. b. small intestine.
    c. esophagus. d. stomach.
14. The undigested food pass from the small intestine into the ..... *(Suez 2022)*
    a. liver. b. pancreas. c. brain. d. large intestine.
15. In the large intestine, ... is absorbed from the undigested food.
    a. starch b. fat c. water d. oil
16. The solid wastes of undigested food become useless to the body, so the body must expel them outside through the .....
    a. mouth. b. anus.
    c. large intestine. d. small intestine.
17. All organs of the human digestive system are considered as ..... adaptation.
    a. only structural b. only behavioral
    c. structural and behavioral d. neither structural nor behavioral
18. During inhalation, air enters through ..... then down the throat.
    a. nose and trachea b. nose and mouth
    c. mouth and lungs d. mouth and trachea
19. The passage of air during inhalation is ..... *(Cairo 2023)*
    a. throat – nose – lungs – trachea.
    b. trachea –throat –lungs – nose.
    c. lungs – nose – throat – trachea.
    d. nose – throat – trachea – lungs.
20. The throat is connected to the lungs through .....
    a. esophagus. b. trachea. c. small intestine. d. ribs.
21. Inside the two lungs, at the end of the smaller air passages (bronchioles) there are tiny air sacs surrounded by .....
    a. air. b. water. c. small intestine. d. blood vessels.
22. Inside the lungs, the trachea is branched into two tubes known as .....
    a. alveoli. b. air sacs. c. bronchi. d. blood vessels.
23. The oxygen gas moves from air into blood at the .....
    a. nose. b. throat. c. trachea. d. lungs.

24. All of the following happen during exhalation, except .....

a. diaphragm relaxes. b. diaphragm contracts.

c. diaphragm moves upward. d. the size of chest decreases.

2 Choose from column (B) what suits it in column (A) :

1.

(A)	(B)
1. Esophagus 2. Small intestine 3. Large intestine 4. Stomach 5. Mouth	a. absorbs water from the undigested food to become solid wastes. b. mixes the food with an acid and digestive juices. c. digestion begins in it. d. is a long winding tube, its length is more than 6 meters. e. is a muscular tube that moves the food down into the stomach. f. solid wastes leave the body through it.

1. ..... 2. ..... 3. ..... 4. ..... 5. .....

2.

(A)	(B)
1. Trachea 2. Blood 3. Diaphragm 4. Lungs	a. is a large muscle at the base of the ribs and helps in inhalation and exhalation. b. are like balloons and they contain little sacs surrounded by blood vessels. c. carries oxygen to all the body organs. d. is a tube through which air travels down into the lungs. e. air enters the body through them.

1. ..... 2. ..... 3. ..... 4. .....

3 Put (✓) or (✗) :

1. The digestive system consists of similar organs that work together to get nutrients from food. ( )
2. The human body gets oxygen gas from food. ( )
3. Mouth, nose, esophagus and stomach are from the organs of the digestive system. ( )
4. The food passes through the large intestine before it goes into the small intestine. *(Sohag 2022)* ( )

5. Digestion process begins in the stomach with the help of saliva. *(Giza 2023)* ( )
6. Tongue and teeth moisten the food, while saliva crushes the food until it becomes soft. ( )
7. Food passes from mouth to stomach through a narrow tube known as small intestine. *(Qena 2022)* ( )
8. Food usually stays in stomach for few hours until it becomes a soupy liquid. ( )
9. Stomach mixes the food with juices that come from liver and pancreas. ( )
10. The food gets broken down into nutrients in the small intestine. ( )
11. The walls of the small intestine absorb the nutrients through tiny blood vessels then blood carries them to all the body parts. ( )
12. Swallowing food without chewing keeps the digestive system healthy. ( )
13. Digestive system ends by anus. ( )
14. The air travels down into the lungs through esophagus. ( )
15. During inhalation, the size of chest becomes narrow. ( )
16. During exhalation, the diaphragm expands. *(Sohag 2022)* ( )
17. The inhaled air is rich in carbon dioxide gas, while the exhaled air is rich in oxygen gas. *(Menofia 2023)* ( )

4 Write the scientific term of each of the following :

1. A system that helps in breaking down food into smaller parts. (.....)
2. A group of organs that work together to perform a specific job. (.....)
3. A process of breaking down food into smaller parts that the body cells absorb and use to get energy and grow. *(Cairo 2023)* (.....)
4. The organ, where the digestion process begins. (.....)
5. They present in the mouth and play an important role in crushing of food. (.....)
6. A liquid substance in your mouth that moistens the bite of food and begins to break it down. (.....)
7. The organ which receives the food from esophagus. (.....)
8. An organ that has tiny blood vessels to absorb the nutrients through its walls. (.....)
9. An organ through which solid wastes of digestion leave the body. *(Luxor 2023)* (.....)

10. A long muscular tube that moves the food down into the stomach. (.....)
11. A process of pulling air in and pushing air out of the body. (.....)
12. It allows the air to pass from the nose to the trachea. *(Alex. 2023)* (.....)
13. A tube that allows air to pass into the two lungs. (.....)
14. Little air sacs surrounded by blood vessels in the respiratory system. (.....)
15. A large muscle that contracts during breathing in and relaxes during breathing out. *(Beni Suef 2022)* (.....)

5 Complete the following sentences :

1. The human body uses ..... system to get nutrients from food and uses ..... system to get oxygen from air.
2. In order for food to become soft, the ..... and ..... work to mix and grind (crush) the food well.
3. In the digestive system, food becomes a soupy liquid in the ..... , while it breaks down into nutrients in .....
4. The ..... is a tube that has muscles to move the food down into the stomach, while ..... is a long winding tube, its length is more than six meters.
5. The longest part of the digestive system where most digestion takes place inside it is .....
6. The small intestine receives juices from ..... and ..... that help in digestion process.
7. The walls of the small intestine absorb the digested food and transfer it into your blood stream through .....
8. In the digestive system, ... intestine absorbs the nutrients through its wall, while ..... intestine absorbs water from the undigested food.
9. Air enters and exits the human body through ..... system. *(Cairo 2022)*
10. Inside the lungs, the ..... end with little air sacs known as .....
11. During inhalation, air travels down from your throat to your lungs through ..... *(Giza 2023)*
12. At the base of your ribs, there is a large muscle that plays an important role in respiration process known as .....
13. During inhalation process, the diaphragm contracts and moves ....., while during exhalation process, the diaphragm expands and moves ..... *(Menofia 2022)*

6 Give reasons for :

1. The human body is made up of different systems.

.....

2. The importance of juices of liver and pancreas.

.....

3. Anus is an important organ in the digestive system.

.....

4. The inhaled air differs from the exhaled air. *(Suez 2023)*

.....

5. Diaphragm plays an important role in respiration process.

.....

.....

7 What happens if ... ?

1. The small intestine is removed from the human body.

.....

2. The nutrients absorbed by the walls of small intestine enter the tiny blood vessels.

.....

3. The diaphragm moves downward during inhalation. *(Minia 2023)*

.....

.....

4. The diaphragm moves upward during exhalation. *(Cairo 2023)*

.....

.....

8 Cross out the odd word :

1. Saliva – Stomach – Esophagus – Small intestine. (.....)
2. Mouth – Lungs – Stomach – Large intestine. (.....)
3. Nose – Throat – Trachea – Anus. *(Alex. 2023)* (.....)

9 **Using the following table, mention the name of the tube-shaped organs of the digestive and respiratory systems inside our bodies :**

(A)	(B)
Organ (1)	through which food passes to the stomach.
Organ (2)	in which the absorption of nutrients takes place.
Organ (3)	it ends with anus.
Organ (4)	it connects the throat with the two lungs.

10 **Compare between :** *(Cairo 2022)*

Points of comparison	Inhalation	Exhalation
1. Diaphragm movement :	.....	.....
2. Size of chest cavity :	.....	.....
3. The air is rich in :	..... gas.	..... gas.

11 **Put (✓) in front of the name of the system to which each of the following organs belongs :**

The organ	The system	
	Digestive	Respiratory
1. Trachea	.....	.....
2. Anus	.....	.....
3. Stomach	.....	.....
4. Lungs	.....	.....
5. Small intestine	.....	.....
6. Esophagus	.....	.....
7. Diaphragm	.....	.....
8. Nose	.....	.....
9. Large intestine	.....	.....
10. Liver	.....	.....
11. Pancreas	.....	.....
12. Throat	.....	.....

12 **Look at the following figure which represents the human digestive system, then mention the name of each organ and complete the sentences below :**

1. .....
   - It has ..... that moistens the food.

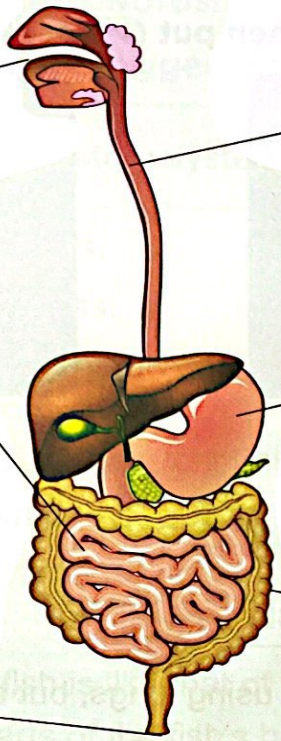
2. .....
   - It is a tube that moves the food down into .....

4. .....
   - It receives juices from ..... and ....., which help to break down food into .....

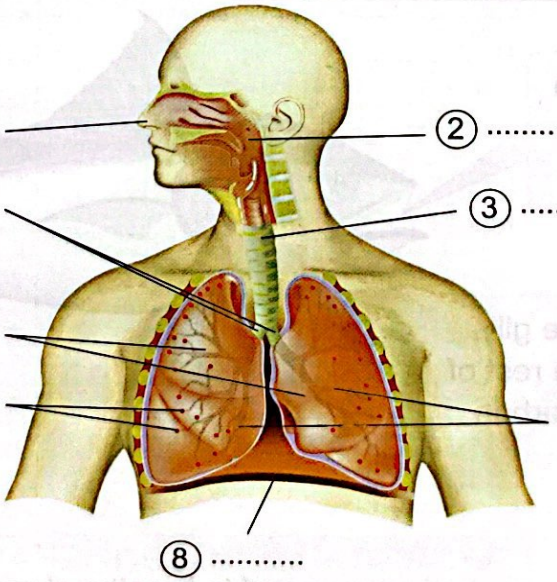
3. .....
   - It mixes food with the ..... acid and ..... juices.

6. .....
   - It helps the body to get rid of solid .....

5. .....
   - It absorbs ..... from ..... food.



13 **Look at the following figure which represents the human respiratory system, then label it :**



LESSON FOUR

Activity 10 How Fish Breathe

▶ **Look at the following pictures, then put (✓) or (✗) :**

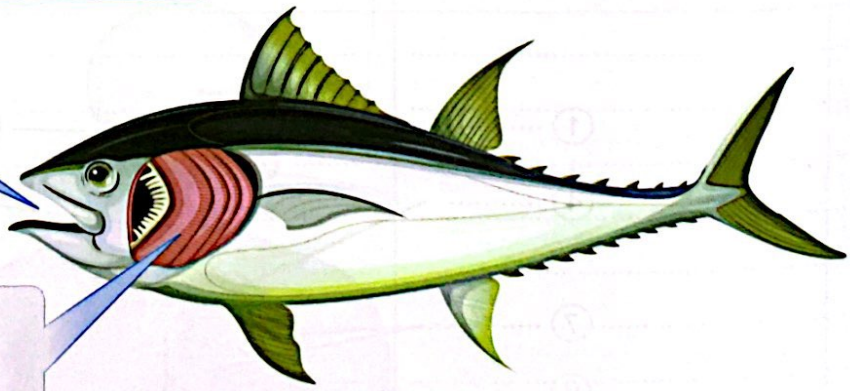
1. Human can stay and breathe under water all the time. ( )

2. Fish can stay and breathe under water all the time. ( )

Structural adaptation of fish :

- Unlike human, fish don't breathe using lungs, but they have gills to breathe.
- Gills are considered as unique structural adaptation that allow fish to live and breathe under water.
- Gills are found on both sides of a fish's head.

How do fish breathe under water ?



Note

Fish need clean water to survive, as we need to breathe clean air to stay healthy.

gills الخياشيم | unique فريدة | release يطلق

Check your understanding

▸ **Compare between the human respiratory system and the fish respiratory system using these words :**

(carbon dioxide – blood – oxygen – air – lungs – water – gills)

Points of comparison	The human respiratory system	The fish respiratory system
Similarities :	- Inhale ..... gas. - Exhale ..... gas. - ..... carries oxygen gas to all the body parts.	
Differences :	- Humans have ..... to inhale oxygen gas from	- Fish have ..... to inhale oxygen gas from .....

▸ **Put (✓) or (✗) :**

1. The importance of gills to fish is like that of lungs to human. ( )
2. Oxygen gas reaches all parts of the fish's body through the blood vessels present in its gills. ( )
3. Carbon dioxide gas is harmful for both fish and human. ( )
4. The type of adaptation in fish's gills is considered as behavioral adaptation. ( )

Activity 11 Humans Change the Environment

- Human activities cause changes or impacts in the ecosystem over time, so organisms will have to adapt these changes to survive.

Human activities that cause changes in the environment :

① Cutting down forests.

② Farming and clearing lands.

③ Building communities instead of grasslands.

④ Introducing plants and animals into the environment that were never part of the ecosystem.

⑤ **Air pollution** that is caused due to the exhausts from cars and some factories.

⑥ **Water pollution** that is caused due to bad habits, such as throwing waste materials to waterways and soil.

Note

Changes resulted from human activities can cause the disappearance (extinction) of plants and animals that once lived in an environment.

Give reason for ...

Although the air, water and soil get polluted as a result of human activities, plants and animals can survive.

Because :

- Some animals can survive by moving to another ecosystem to find what they need.
- Plants depend on their seeds to land in a better place for them to survive and grow.

disappearance	أختفاء	farming	زراعة	waterways	الممرات المائية	pollution	تلوث
extinction	إنقراض	communities	المجتمعات	clearing land	تسوية الأرض	bad habits	عادات سيئة
human activities	أنشطة الإنسان	exhausts	عوادم	introduce	يدخل		

- **As the human activities have negative effects on animals and plants, they also have negative effects on human such as :**

① Damage of lungs.

② Asthma (breathing difficulty).

③ Heart diseases.

Notes

1. Water pollution makes the human hard to find clean drinking water.
2. Air, water and soil pollution make the crops cannot grow.
3. Air pollution (smog) makes the human hard to breathe.
4. People live in cities that have high air pollution level must change their lifestyle to decrease air pollution.

The role of human to help restore ecosystem :

- **As humans can cause harmful changes, they can help restore their ecosystems by :**
  - Replanting the cleared forests.
  - Removing the pollutants of air and water.
  - Preserving plants and animals in these ecosystems.

Check your understanding

▸ Put (✓) or (✗) :

1. Water pollution affects fish, but doesn't affect humans and plants. ( )
2. Humans must keep air, water and soil clean. ( )

In the Assessment Book :
Try to answer :
Self-Assessment ④

negative effects	أثار سلبية	lifestyle	نمط الحياة	damage of lungs	تليف الرئتين	restore	يستعيد
asthma	مرض الربو	remove	يزيل	smog	ضباب دخانى		

Exercises on Lesson 4

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. Both of human and fish .....
   a. can breathe in air. b. can breathe in water.
   c. use oxygen gas to breathe in. d. use carbon dioxide gas to breathe in.
2. Fish use ..... to breathe in water. *(Sohag 2022 / Sharkia 2023)*
   a. tail b. eyes c. lungs d. gills
3. Gills differ from lungs, in that gills .....
   a. take in oxygen gas. b. expel out carbon dioxide gas.
   c. extract oxygen gas from water. d. extract oxygen gas from air.
4. Gills in fish are considered as .....
   a. behavioral adaptation. b. structural adaptation.
   c. camouflage adaptation. d. behavioral and structural adaptations.
5. All of the following human activities can negatively affect the nature, except .....
   a. cutting down forests. b. removing air pollutants.
   c. farming and clearing lands. d. throwing wastes in waterways.
6. Human activities and bad habits can pollute ..... of an ecosystem.
   a. air and soil only b. soil and waterways only
   c. air and waterways only d. air, soil and waterways
7. Pollution of an ecosystem can affect .....
   a. plants and animals only. b. animals and humans only.
   c. humans and plants only. d. plants, animals and humans.
8. If the environment is slowly changed, plants ..... to survive and grow.
   a. must have a taproot
   b. must have buttress roots
   c. must decrease their adaptation
   d. must land their seeds in another better place
9. From the negative effects of human activities on the human health are .....
   a. lung damage and asthma. b. asthma and wounds.
   c. heart problems and wounds. d. lung damage and wounds. *(Qalyoubia 2022)*

10. Human can help restoring ecosystem by all of the following activities, except .....
    a. replanting the cleared forests.
    b. removing air and water pollutants.
    c. producing more factories exhausts.
    d. preserving existed plants and animals.

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Changes that done by human and may harm existed birds in an ecosystem are 2. Changes that done by human and cause air pollution are 3. Changes that done by human and can restore air in an ecosystem are	a. building more factories that produce more smog inside cities. b. rainfall, floods and severe weather events. c. replanting the cleared forests and removing of air pollutants. d. clearing lands and cutting down forests.

1. ..... 2. ..... 3. .....

3 Put (✓) or (✗) :

1. Human breathes using gills, while fish breathes using lungs. ( )
2. Gills are found on one side of a fish's head. ( )
3. Both of lungs and gills take carbon dioxide gas inside the body and release oxygen gas outside the body. ( )
4. Gills are unique structural adaptation that allow fish to live and breathe under water. ( )
5. As human needs clean water to drink, fish needs clean air to breathe. ( )
6. Cutting down rainforests may cause disappearance of starred agama. ( )
7. Throwing waste materials in waterways is one of the bad habits that must be stopped. ( )
8. The way of survival of animals differ from that of plants, if the ecosystem is rapidly changed. ( )
9. Pollution is one of the most dangerous problems that affect all living organisms. ( )
10. Respiratory problems like lung damage and asthma occur when water pollution is high over a long period of time. ( )

11. Humans can restore ecosystem as well as they can harm it. ( )
12. When the pollution level in a city is very high, people are forced to change their lifestyle. ( )

4 Correct the underlined words :

1. Fish use gills to take carbon dioxide gas out of the water. *(Menofia 2022)* (.....)
2. Air enters the mouth of a fish and then passes across the gills. (.....)
3. Blood vessels of lungs and gills are similar in carrying carbon dioxide gas to all the body parts. (.....)
4. Gills are unique behavioral adaptation that allow fish to breathe under water. (.....)
5. When an ecosystem is severely polluted, animals only are affected. (.....)
6. Water pollution is caused due to the smog of factories and cars. (.....)

5 Write the scientific term of each of the following :

1. Structures that allow fish to breathe under water. (.....)
2. A gas presents in air and water, and is very important for breathing process. *(Behira 2022)* (.....)
3. A gas which the human and fish bodies must get rid of during exhalation process. (.....)
4. A kind of pollution that is caused due to throwing waste materials into the waterways and soil. (.....)
5. A kind of pollution that is caused due to the exhausts from cars and some factories. (.....)

6 Complete the following sentences :

1. Humans use ..... to breathe, while fish use ..... to breathe. *(Cairo 2023)*
2. In both human and fish, ... carries oxygen gas to all the body parts.
3. Gills of fish are considered as ..... adaptation that allow fish to breathe under water.
4. Human activities and bad habits can pollute ..... , ... and soil of an ecosystem.
5. All living organisms including humans, animals and ..... are affected negatively by pollution.
6. One of air pollutants that makes human hard to breathe is .....

7. When air pollution is very high over a long period of time, it may cause ..... , ... and heart diseases to humans.

7 Give reasons for :

1. Gills are unique structural adaptation in fish. *(Cairo 2023)*

.....

.....

2. Cars and factories exhausts cause breathing problems.

.....

.....

3. Sometimes people in big cities are forced to change their lifestyle.

.....

.....

8 What happens if ... ?

1. Human activities and bad habits increases.

.....

2. The exhausts from cars and factories increase in big cities.

.....

.....

3. Water pollution increases. (for human and fish).

.....

.....

9 Look at the opposite figures, then answer the questions :

1. The death of fish in figure (1) may happen due to .....

a. wildfires.
b. soil pollution.
c. water pollution.
d. cutting forests.

Figure (1)

2. In your opinion, the smog produced from the factories in figure (2) may cause ..... in the ecosystem.

a. increasing of air pollution
b. decreasing of air pollution
c. keeping the lungs of human healthy
d. increasing the number of plants and animals

Figure (2)

LESSON FIVE

Activity 12 Record Evidence Like A Scientist

- In this concept, you have learned a lot about how different types of adaptations help plants and animals survive.
- In this activity, which will be repeated at the end of each concept, we will learn how to think like scientists to answer a question about one of the main points of this concept through four main steps :
  - **Step (1) : The Question.**
  - **Step (2) : My Claim.**
  - **Step (3) : My Evidence.**
  - **Step (4) : My Scientific Explanation.**

Step (1) The Question

How do different types of animals and plants adapt to survive in extreme climate ?

Step (2) My Claim

Animals and plants have the ability to change their bodies structures and behaviors to adapt the extreme climate to survive in their environments.

Note

Your claim should be formed of a sentence that gives an answer for the previous question in step (1).

Step (3) My Evidence

- **Examples of structural adaptations :**
  - Some animals have thick fur to keep their bodies warm, while some other animals have extra-long ears to keep their bodies cool.
  - Some plants have tiny leaves to hold in water.
- **Examples of behavioral adaptations :**
  - Some animals stay in burrows to keep their bodies warm or cool.

Note

You should mention enough and suitable evidence that support your claim.

evidence دليل | scientific explanation التفسير العلمى | claim إدعاء / افتراض

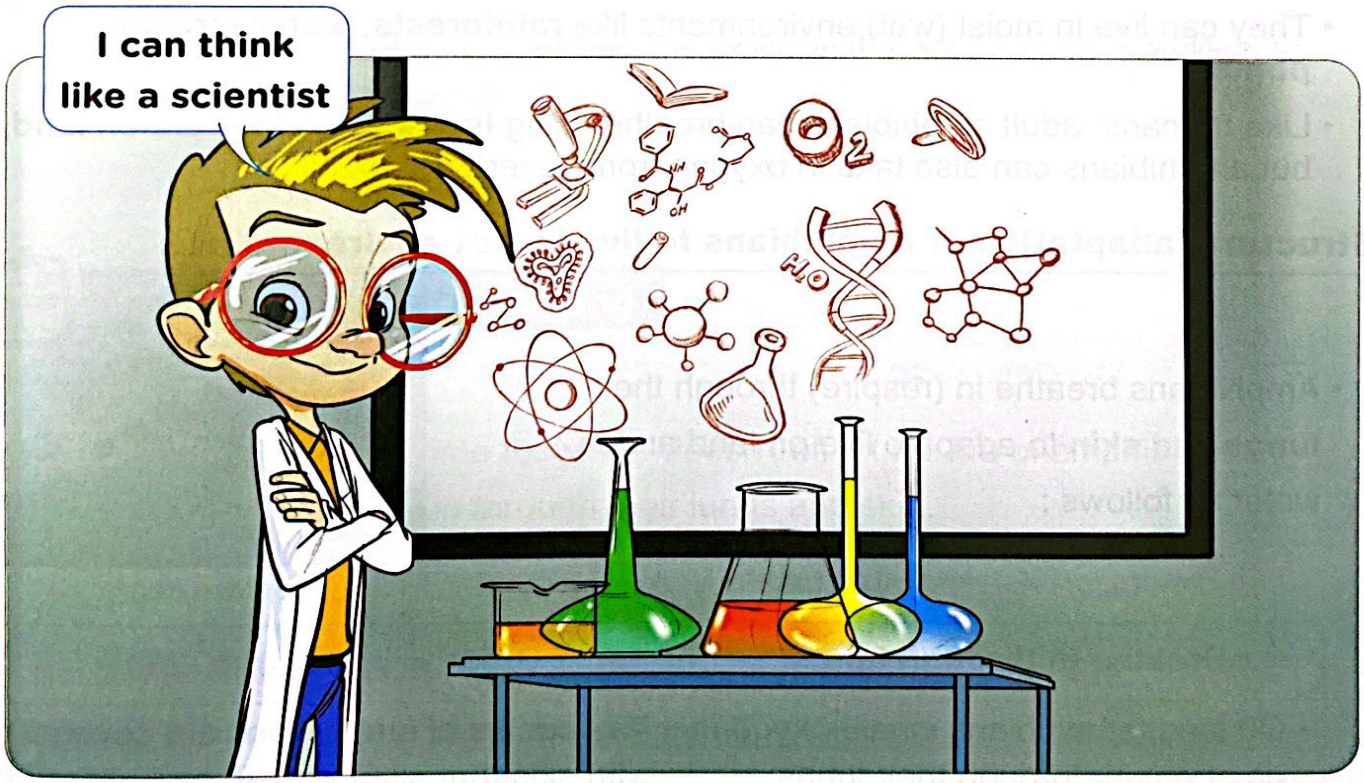
Step 4 My Scientific Explanation

Animals and plants can survive in extreme climate through structural and behavioral adaptations, where :

- The structural adaptation in the polar bears that have thick fur and penguins that have a layer of fat to adapt the cold climate in polar regions.
- The structural adaptation in fennec foxes that have extra-long ears and also the behavioral adaptation as they stay in burrows to adapt the hot climate in desert regions.
- The structural adaptation in acacia trees that have tiny leaves to hold in water to adapt hot climate in savannah regions.

Note

Your scientific explanation should explain your claim and evidence introducing some supportive examples from what you have learned.



supportive داعم scientist عالم

Activity 13 STEM in Action

Careers and adaptation :

- Through researches, scientists can learn how different organisms adapt to their environments and help **endangered species** survive.
- In this lesson, we are going to study **amphibians** which are one of the most amazing living organisms on Earth.

Amphibians :

- They are small animals that live on **land** and in **water** such as :

Frogs

Toads

Salamanders

- They can live in moist (wet) environments like **rainforests**, **water streams** and **ponds**.
- Like humans, adult amphibians can breathe using **lungs** when they are on **land**, but amphibians can also take in oxygen from water.

Structural adaptation of amphibians to live in wet environments :

- Amphibians breathe in (respire) through their **lungs** and **skin** to adapt to live on land and in water as follows :

Golden frog

Breathe in through lungs	Breathe in through skin
• On land, amphibians inhale oxygen gas from air through their lungs.	• The bodies of amphibians are covered with skin that allows water and gases to pass through, so they can absorb (extract) oxygen directly from water.

careers	وظائف	amphibians	برمائيات	researches	أبحاث
endangered species	الأنواع المهددة بالإنقراض	adult	بالغ	pond	بركة ماء
skin	جلد				

- **Amphibians need clean water and air to stay healthy, because they are very sensitive to the effects of :**
  - Water pollution. - Air pollution. - Viruses that can travel through water.

The role of scientists to protect many types of amphibians from extinction :

- **Scientists (biologists) are working to save many types of amphibians from extinction by studying :**
  - How amphibians breathe in air and water.
  - Factors cause air and water pollutions that affect the life of amphibians.
  - What make these animals sick in their environments.

How do people help in protection of amphibians from extinction ?

- **Clean air and water are important for amphibians, so people should :**
  - Avoid throwing waste materials in water.
  - Dispose of chemicals in a correct way helps to avoid water pollution.

Note

Ninety species of amphibians have become extinct in the last 20 years in addition to 124 other endangered species.

Check your understanding

▶ Put (✓) or (✗) :

1. Throwing chemicals into the water doesn't affect the life of amphibians. ( )
2. Amphibians breathe in through their lungs and skin. ( )

Review on Concept (1.1)

To review this concept look at the **Assessment Book** "**Part 2 : Final Revision**".

In the Assessment Book :

Try to answer :
- Self-Assessment (5)
- Model Exam on Concept (1.1)

sensitive	حساس	golden frog	الضفدع الذهبى	dispose of	يتخلص من	in addition to	بالإضافة إلى
biologists	علماء الأحياء	viruses	فيروسات	extinct	ينقرض	operate	يُشغل
protection	حماية	sick	يمرض	furniture	أثاث المنزل		

Exercises on Lesson 5

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. Amphibians are adapted to live in ..... that suits their adaptation.
   a. dry environment
   b. moist environment
   c. arctic environment
   d. sandy environment
2. Starred agama and salamander, ...
   a. both are reptiles.
   b. both are amphibians.
   c. the first is a reptile, while the second is an amphibian.
   d. the first is amphibian, while the second is reptile.
3. If amphibians have gills and they don't have lungs and also cannot respire through skin, then .....
   a. they cannot live outside water.
   b. they can live outside water.
   c. they cannot live under water.
   d. they can live in desert landscapes.
4. Amphibians can take in oxygen gas from .....
   a. water only.
   b. air only.
   c. food and air.
   d. water and air.
5. In rainforests, we can find .....
   a. panther chameleon and arctic foxes.
   b. amphibians and fennec foxes.
   c. arctic foxes and fennec foxes.
   d. panther chameleon and amphibians.
6. If the number of an animal species becomes zero due to severe changes in its natural habitat, this means that this species .....
   a. becomes endangered.
   b. becomes extinct.
   c. will survive.
   d. going to be extinct.
7. Both humans and amphibians breathe in oxygen. Which of the following sentences is correct ? .....
   a. Both can breathe in oxygen gas through lungs.
   b. Both can take in oxygen gas through skin.
   c. Humans can breathe in oxygen gas from water and air.
   d. Amphibians can breathe in oxygen gas through gills.

8. Blood vessels that carry oxygen gas in amphibians, present in .....
   a. skin and digestive system.
   b. lungs and eyes.
   c. digestive system and eyes.
   d. skin and lungs.
9. Amphibians, lizards, trees, birds, fish and humans .....
   a. some of them need oxygen gas to respire.
   b. some of them need carbon dioxide gas to respire.
   c. all of them need oxygen gas to respire.
   d. all of them need carbon dioxide gas to respire.
10. If a pond where some frogs live is highly polluted with wastes and viruses. What you have to do to preserve these frogs ? .....
   a. Fill in the pond with sand.
   b. Dry this pond from water.
   c. Supply this pond with more oxygen gas.
   d. Transfer these frogs to a clean water habitat.

2 Put (✓) or (✗) :

1. Amphibians include frogs and salamanders. *(Alex. 2023)* ( )
2. The natural habitat of amphibians is rainforest, while that of panther chameleon is desert. ( )
3. The number of amphibians increases in the last few years, due to restoring of its ecosystem. ( )
4. Arctic foxes and amphibians cannot be found in the same habitat. ( )
5. Salamanders and fish can breathe in air through lungs. ( )
6. In the habitat of amphibians, we can find some types of reptiles. ( )
7. Scientists try to save golden frogs from extinction. ( )
8. Clean water and air are very important for respiration process in amphibians. ( )
9. It is important to advice people not to throw waste materials in waterways to save amphibians' life. ( )

3 Write the scientific term of each of the following :

1. Species that include frogs, toads and salamanders. (.....)
2. The organ through which salamanders can take in oxygen gas directly from water. (.....)
3. A gas is present in water and air that living organisms breathe in during respiration. *(Cairo 2022)* (.....)
4. The type of adaptation that allows frog to take in oxygen gas from water directly through the skin. (.....)
5. A respiratory organ that contains little sacs, and found in humans, frogs and cows but not in fish. (.....)

4 Complete the following sentences :

1. Starred agama lizard is a ....., while frog is an .....
2. Humans, amphibians and reptiles have ..... to breathe in oxygen gas from air.
3. Bull shark can respire through ..... only, while salamander can respire through ..... and .....
4. Both humans and adult amphibians have no ..... that is present in fish for respiration.
5. As the pollution rate of water in ponds and air increases, the number of amphibians .....
6. Amphibians have two ways to breathe in oxygen, one from air through ..... and the other from water through .....
7. The ability of amphibians to take in oxygen gas from water through the skin, is considered as ..... adaptation. *(Giza 2022)*
8. All living organisms breathe in oxygen gas and gives out ..... as a waste product.
9. Pollution of ..... and ..... may cause a big problem on the amphibians survival.

5 Correct the underlined words :

1. Fish can breathe only in <u>air</u>. (.....)
2. Amphibians live in <u>dry</u> environments. (.....)
3. Starred agama is a reptile, while frog is <u>a lizard</u>. (.....)
4. Amphibians have <u>gills</u> as well as humans for respiration. (.....)

5. Amphibians can take in carbon dioxide gas from air for respiration. (.....)
6. In rainforests, we can find panther chameleon and arctic fox. (.....)
7. Reptiles have two different ways for breathing. (.....)
8. Humans and frogs can breathe in oxygen gas in water. (.....)

6 Give reasons for :

1. Skin of fish is different from that of frog, although both of them live in water.

.....

.....

2. Dry seasons is very harmful for amphibians.

.....

.....

3. Pollution of air and water can affect the survival of amphibians.

.....

4. Scientists must study how amphibians interact with their environments.

.....

7 What happens if ... ?

1. Pollution level increases in the natural habitat of amphibians.

.....

2. The ecosystem of amphibians is containing clean air and water.

.....

3. Amphibians don't have lungs and breathe only through skin.

.....

4. The number of predators of amphibians increases.

.....

.....

5. Salamanders have lungs only to respire.

.....

.....

6. Skin of frogs becomes dry.

.....

.....

Model Exam 1 on Concept (1.1)

Total mark: 15

1 (A) Choose the correct answer : *(5 marks)*

1. Both golden frog and polar bear, ...
   a. live in the same habitat.
   b. can breathe in oxygen gas in water.
   c. have the same body coat.
   d. are living organisms.
2. The color of the body coat of arctic fox changes according to the season, this is considered as .....
   a. change of the way of breathing.
   b. a type of structural adaptation.
   c. change of the way of drinking.
   d. a type of behavioral adaptation.
3. In dry desert, most plants need ..... to get water from the sandy soil.
   a. long trunk
   b. long roots
   c. long branches
   d. long leaves
4. The food moves into the stomach through the ..... *(Alex. 2023)*
   a. esophagus.
   b. trachea.
   c. small intestine.
   d. tongue.

(B) Give a reason for the following :

Gills are unique structural adaptation in fish.

.....

.....

2 (A) Put (✓) or (✗) : *(5 marks)*

1. Both salamander and fish can breathe in through lungs. ( )
2. In polar environment, the sandy-colored fur of caracal helps it blend in with snow. ( )
3. Panther chameleon and agama lizard can use one of their eyes for searching for food and the other one to look out for danger. ( )
4. Adaptation to store water is an important character for plants that live in dry desert environment. ( )

(B) What happens if ... ?

The diaphragm moves upward during exhalation. *(Minia 2023)*

.....

.....

3 (A) Correct the underlined words : *(5 marks)*

1. Amphibians live in dry environments. (.....)
2. Reptiles like toads have two different ways for breathing. (.....)
3. Fish use gills to take in carbon dioxide gas out of the water. (.....)
4. Mangrove tree has wide leaves to absorb a large amount of sunlight. (.....)

(B) Give only one example of behavioral adaptation in bull shark.

.....

Model Exam 2 on Concept (1.1)

Total mark: 15

1 (A) Write the scientific term of each of the following : (5 marks)

1. It covers the body of some types of bears to keep their bodies warm and to blend in with snow. (.....)
2. A feature in bull shark, in which the lower surface of its body is lighter than its upper surface. (.....)
3. A plant lives in salt water environment and it has long roots to resist water waves. (.....)
4. An organ through which solid wastes of digestion leave the body. (.....)

(B) Cross out the odd word :

1. Penguin – Acacia tree – Pine tree – Polar bear. (.....)
2. Panther chameleon – Fennec fox – Bull shark – Agama lizard. (.....)

---

2 (A) Choose the correct answer : (5 marks)

1. The stomach has an acid that helps in .....
   a. crushing of food.
   b. digestion of food.
   c. absorption of digested food quickly.
   d. absorption of water from undigested food.

2. Water lily has wide floating leaves to .....
   a. prevent the loss of water. b. resist the water waves.
   c. absorb a large amount of sunlight.
   d. absorb a large amount of water.

3. All of the following living organisms live in desert, except .....
   a. palm tree. b. pine tree.
   c. starred agama lizard. d. fennec fox.

4. Amphibians absorb oxygen directly from water by their .....
   a. skin. b. gills. c. lungs. d. nose.

(B) Correct the underlined words :

1. Gills are unique behavioral adaptation that allow fish to breathe under water. (.....)

2. Small intestine is a long muscular tube that moves food down into the stomach. (.....)

3 (A) Look at the opposite figures, then answer the questions below :

(1) Which figure represents inhalation ? (.....)

(2) Which figure represents exhalation ? (.....)

(3) In figure (a), ... muscle contracts and the size of chest .....

(4) In figure (b), the air that comes out is rich in ..... gas .

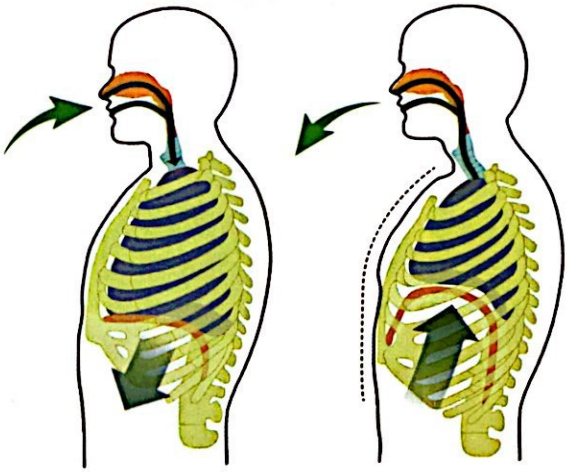


Figure (a) Figure (b)

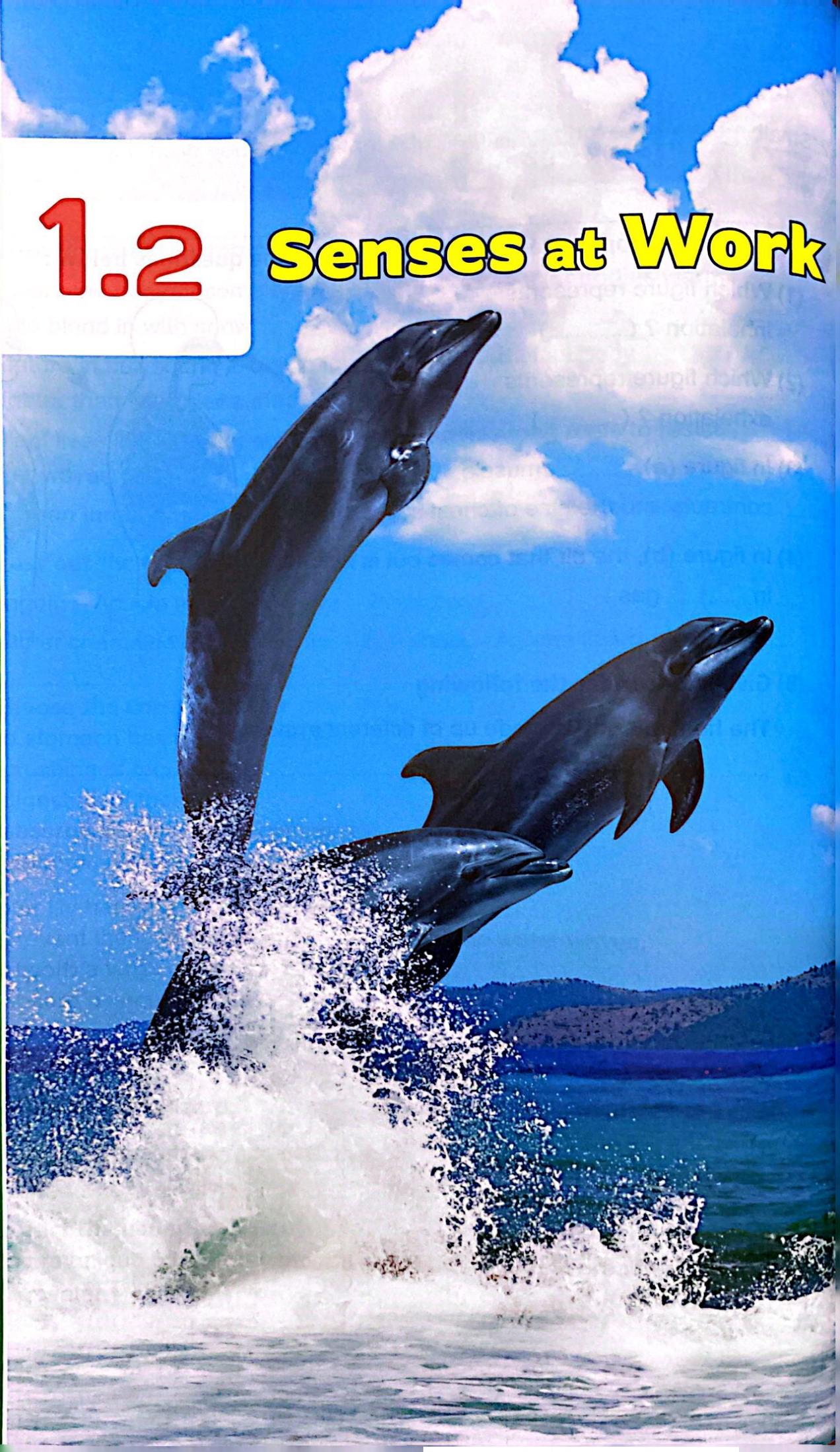
(B) Give a reason for the following :

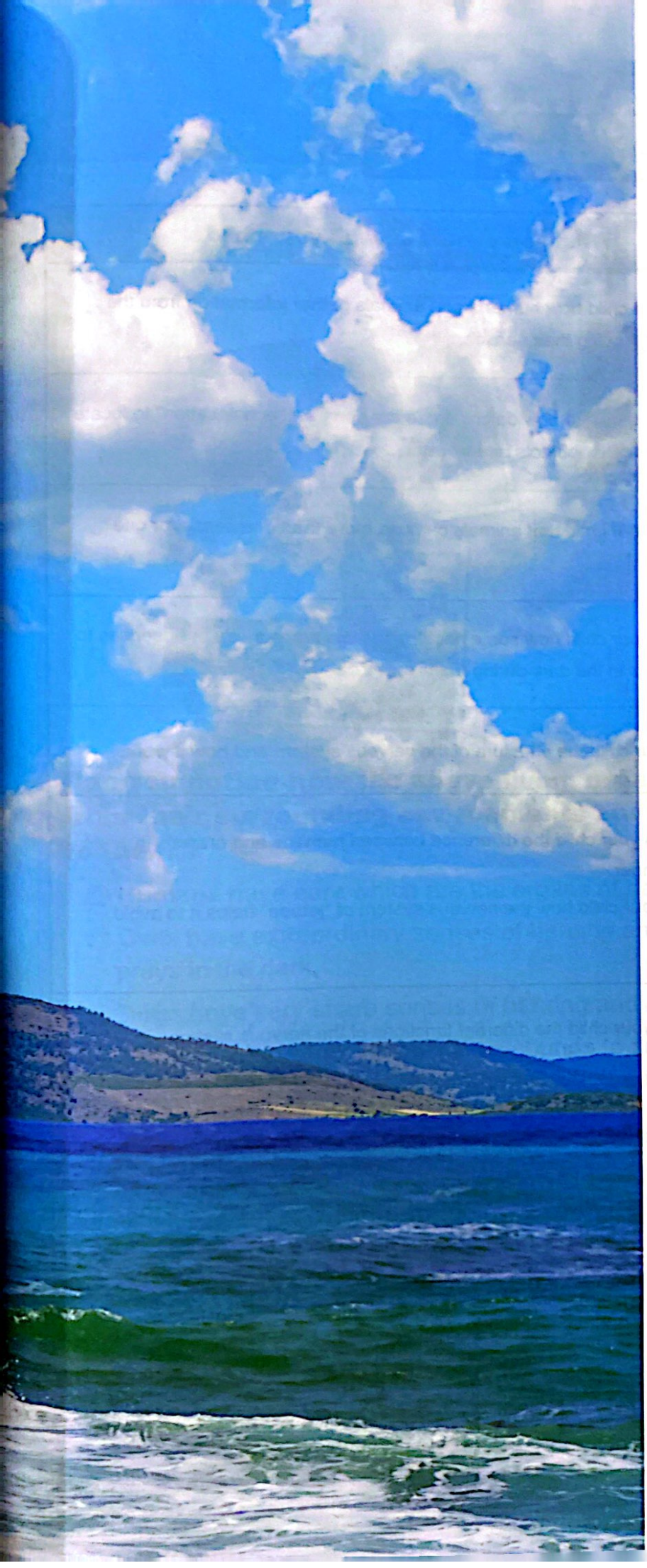
The human body is made up of different systems.

.....

Concept

1.2 Senses at Work





Learning outcomes

By the end of this concept, your child will be able to :

- Develop models illustrating how animals receive, process and react to information in their environments.
- Explain how organs and systems work together to process and respond to input from the senses.
- Plan and carry out investigations to produce evidence that the senses play a role in reaction time.
- Argue, using evidence, that light and sound allow for the transfer of information through systems of communication.
- Compare innovative human designs to systems of communication in the natural world.

Key vocabulary

- Brain
- Reflex
- Sound
- Nerve
- Echo
- Communication systems
- Receptor
- Senses
- Information
- Echolocation

Notes For Parents On Concept [1.2]

Lessons	Activities	What you should do with your child
1	Activity 1	Explain to your child how humans and animals gather information from the environment by using their senses.
	Activity 2	Discuss with your child how dolphins use the sense of "echolocation" to locate their preys and other objects under water.
	Activity 3	Discuss with your child that animals can use more than one sense for one purpose.
2	Activity 4	Discuss with your child how some nocturnal animals use their super senses to hunt their preys in the dark during the nighttime.
	Activity 5	Explain to your child the structure of the nervous system and how it works.
	Activity 6	- Discuss with your child the difference between humans and animals in avoiding danger. - Explain to your child how the nervous system of "jerboa" helps it to avoid danger.
3	Activity 7	Discuss with your child the different functions of the nervous system.
	Activity 8	Let your child answer some questions about the nervous system and its functions to check his/her understanding.
4	Activity 9	- Explain to your child how ants communicate with each other. - Discuss with your child the way of communication that humpback whale use.
	Activity 10	Let your child know the similarities and differences between the special cane of the blind person and the bat echolocation property.

LESSON ONE

Activity 1 Can You Explain ?

Can you notice how the above living organisms receive information from their surrounding environments and how they are responding to them ?

1. **Humans** have ears which are the organs of hearing to listen to music.
2. **Owls** have extraordinary senses of hearing and sight to be able to find their preys in the dark.
3. **Dogs** have very sharp senses of hearing and smell, which are used in guarding.
4. **The Egyptian mongoose** makes sounds to communicate with other mongooses to move from one place to another or when searching for food.

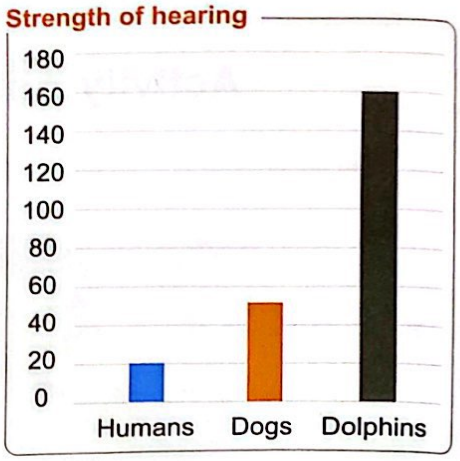
▸ **From the previous explanation we conclude that :**
Animals have senses like humans that enable them to communicate with each other and adapt to their surrounding environments.

▸ **In this concept, we will study :**

- Dolphin senses.
- Super senses of some animals.
- The nervous system and how it works.
- Songs of whales.
- How the five senses work.
- Communication systems.

extraordinary	أستثنائى	Egyptian mongoose	النمس المصرى	guarding	حراسة
responding	يستجيب				

Activity 2 Dolphin Senses



▸ **Look at the opposite graph, then put (✓) or (✗) :**

Living organisms in the graph have similar hearing senses. ( )

- Dolphins have sharp senses that help them survive through :

- Finding food.
- Protecting themselves under water.

- The most sharp sense that dolphins have is the sense of hearing, since they can hear all kinds of sound.

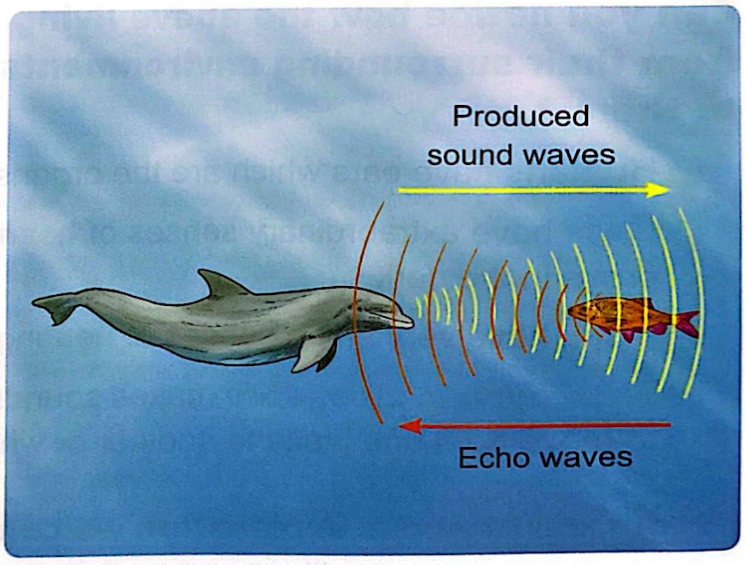
How can dolphins locate organisms and other things under water ?

Dolphins use a property known as "echolocation" that depends on **"echo"** to determine the location of other living organisms and objects in the water.

Echo is the bouncing back of sound waves when they hit a solid surface.

▸ **Let's see how dolphin use the sense of echolocation :**

1. Dolphin produces sound waves that travel through water.
2. These waves hit objects then bounce back to the dolphin in the form of echo.
3. Echo helps the dolphin to locate its prey and other objects.



Check your understanding

▸ **Put (✓) or (✗) :**

1. Smell is one of the most sharp senses of dolphins. ( )
2. Echo helps dolphins locate their preys. ( )

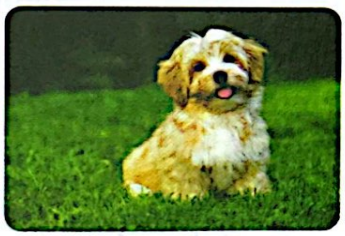
sharp senses	الحواس الفائقة	echolocation	تحديد الموقع بالصدى	hit	يصطدم
survive	يتعايش ،	echo	صدى	bounce	يرتد (يرجع)
locate	يحدد مكان	waves	موجات		

Activity 3

What Do You Already Know About Senses at Work ?

▸ Animal perceptions :

- You have known that animals have senses like those of humans.
- Each animal can use more than one sense for more than one purpose to adapt to its habitat, as shown in the following examples :

Animal	Senses	The purpose
Fox 	Hearing and sight	Avoiding danger
Chameleon 	Sight and taste	Finding food
Dog 	Smell and sight	Recognizing friends
Monkey 	Touch, smell, sight, taste and hearing	Identifying objects

Check your understanding

▸ Put (✓) or (✗) :

1. The owl can search for food using its sight sense. ( )
2. The cat can avoid danger using its taste sense. ( )

In the Assessment Book :
Try to answer :
Self-Assessment ⑥

perceptions	الإدراك الحسى	adapt	يتكيف	avoid	يتجنب
purpose	الغرض	recognizing	التعرف على		

Exercises on Lesson 1

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. To know if a cup of water is hot or cold, we need to use the sense of .....
   a. sight. b. hearing. c. smell. d. touch.
2. We can distinguish between water and milk through .....
   a. taste and hearing. b. sight and hearing.
   c. smell and hearing. d. taste and sight.
3. The sensory organs of a dolphin help it do all of the following, except .....
   a. surviving. b. finding food.
   c. finding water. d. protecting itself under water.
4. If there is some salt in a dish and some sugar in another dish, you can distinguish between them through the sense of .....
   a. smell. b. taste. c. touch. d. hearing.
5. The five senses of humans and animals are .....
   a. sight, hearing, touch, smell, and movement.
   b. sight, movement, taste, touch, and smell.
   c. taste, touch, movement, hearing, and smell.
   d. sight, hearing, taste, smell, and touch.
6. Echo helps bats and dolphins to locate ..... of their preys.
   a. the location b. the color
   c. the smell d. the taste
7. Dolphins depend on their sharp sense of ..... to get food.
   a. sight b. taste c. smell d. hearing

2 Put (✓) or (✗) :

1. A human can identify music through ears which are the organs of sight. ( )
2. The Egyptian mongoose can communicate with its species by making sounds. ( )
3. The sense of hearing of dolphins is stronger than that of human. ( )
4. We use our sense of smell to identify the color of a flower. ( )
5. Skin helps human distinguish between the taste of different types of food through the sense of touch. ( )
6. Chameleon uses its tongue to taste food. ( )
7. Foxes have sharp sense of taste to avoid dangers. ( )
8. Bats depend on camouflage property to find its food. ( )

3 Write the scientific term of each of the following :

1. The property that depends on the sense of hearing through which dolphins locate their preys under water. (.....)
2. The organ used to recognize different colors. (.....)
3. The organ used to recognize different odors. (.....)
4. The sense used to differentiate between smooth and rough surfaces. (.....)
5. The return back of sound waves on hitting a solid surface. (.....)

4 Complete the following sentences :

1. The dog uses the senses of ..... and ..... in guarding.
2. A human can pay attention to an alarm bell in case of danger through the sense of .....
3. Dolphins have sharp sense of ....., which they use to locate living organisms under water through the ..... property.
4. We can identify the odor of flowers using the ..... sense.
5. Echo is the bouncing off ..... waves when they hit a solid surface.

5 Correct the underlined words :

1. The dolphin has sharp sense of touch. (.....)
2. The dog uses its eyes to recognize odor of humans. (.....)
3. The fox uses its tail and ears to run away when it sees or hears its enemies. (.....)
4. Dolphins and dogs use echolocation property to hunt. (.....)

6 Give reasons for :

1. The Egyptian mongoose make sounds.

.....

.....

2. Owls can hunt during the night.

.....

.....

3. Dogs are used in guarding.

.....

4. Dolphins can hear all kinds of sound. *(Cairo 2023)*

.....

7 What happens to ... ?

The sound waves produced by a dolphin when they hit an object under water.

.....

.....

8 **Arrange the following steps to illustrate how dolphins use their sharp hearing to catch preys :**

(.....) The sound waves travel and hit the prey, then bounce back to the dolphin in the form of an echo.

(.....) The echo helps the dolphin locate its prey.

(.....) The sound produced by a dolphin is transmitted in the form of waves called sound waves.

9 **Look at the following pictures, then choose the correct answer :**

Animal (1)

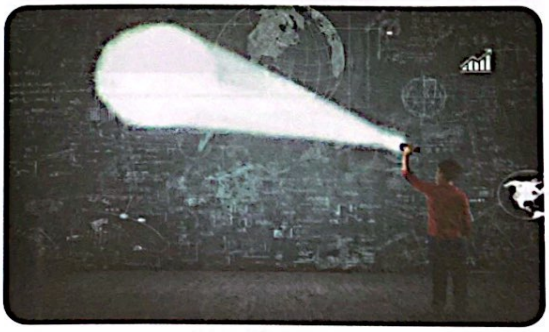
Animal (2)

1. The sharpest senses that animal (1) has are .....
   a. touch and smell.
   b. smell and hearing.
   c. taste and sight.
   d. hearing and taste.
2. Animal (1) uses one or both of its sharpest senses in each of the following situations, except .....
   a. identifying friends.
   b. identifying food.
   c. recognizing strangers.
   d. tasting food.
3. The sharpest sense that animal (2) has is .....
   a. hearing.
   b. taste.
   c. touch.
   d. smell.
4. Animal (2) uses its super sense in each of the following situations, except .....
   a. locating objects under water.
   b. avoiding danger.
   c. detecting scents of living organisms under water.
   d. locating preys under water.

LESSON TWO

Activity 4 Sensory Organs of Nocturnal Animals

▸ **Look at the following pictures, then put (✓) or (×) :**



1. Human can see everything clearly inside a dark room. ( )
2. An owl can see its prey in the dark during nighttime. ( )

- You can hear the noise of something moving through the darkness, even you cannot see it clearly.
- Some animals known as "Nocturnal animals" look for their food at night using their sharp senses.

Nocturnal animals :

They are animals that become active at night to look for their food.

▸ **Why do some animals become active at night ?**

1. In extremely hot places, the best time to look for food is nighttime, when it is cooler.
2. Some animals hunt food that is only available at night.
3. Some animals depend on darkness to hide from their preys and surprise them.

▸ **How can nocturnal animals hunt without much available light ?**

Super sensory adaptations of nocturnal animals allow them to navigate safely and find food in the dark, as shown in the following examples :

nocturnal animal حيوان ليلى navigate التنقل

1. Bats :

- Bats depend on echolocation to find their food.

Purpose :
To help bats move around and find its food (preys) at night.

Notes

1. Both bats and dolphins use echolocation to find their food.
2. Unlike dolphins, bats are nocturnal animals that can hunt at night.

2. Owls :

- Owls have very sharp sight and hearing senses.

*** Owl's face :**
It has a bowl-shaped face with special type of feathers in its head. G.R.
- To direct distant sounds into the owl's ears.

*** Owls' large eyes :**
Its eyes allow the owl to see tiny and far-away movements of their preys.

*** Owl's head :**
Its head has the ability to turn in all directions. G.R.
- To search for preys everywhere.

Purpose :
To detect the movements and sounds of tiny distant preys.

Check your understanding

▸ **Choose the correct answer :**

1. The senses of ..... are from the very sharp senses in owls.
   a. hearing and smell b. sight and smell c. sight and hearing
2. Which of the following animals are not a nocturnal animal ? .....
   a. Bat. b. Dolphin. c. Owl.

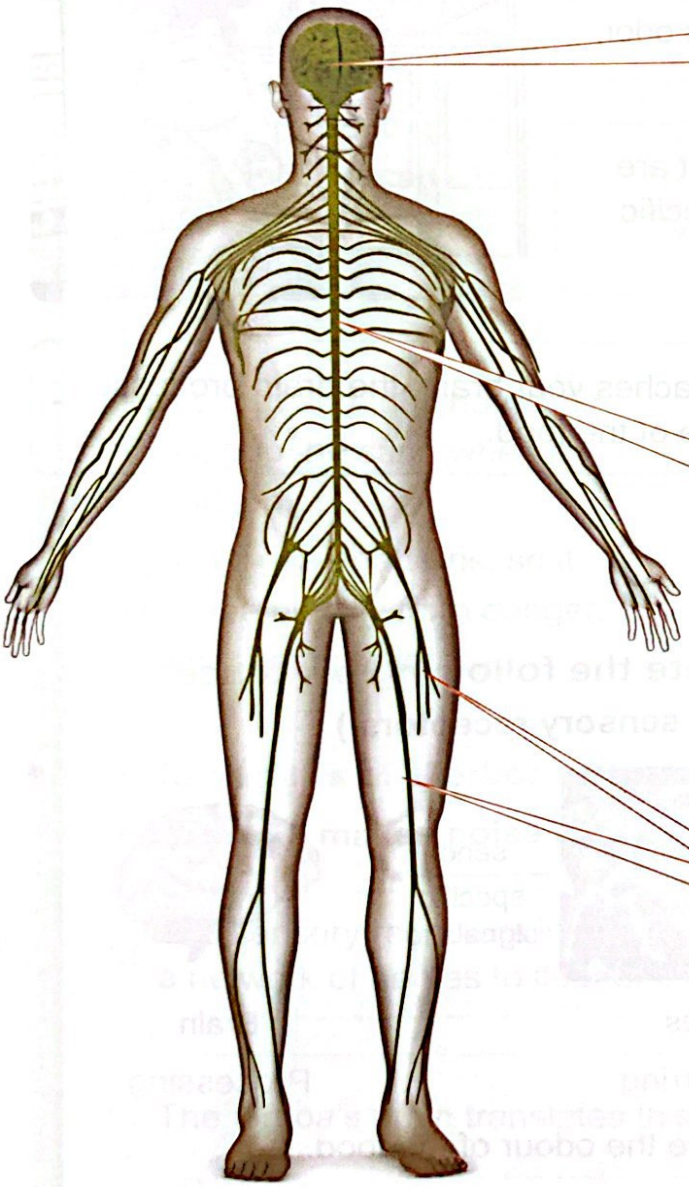
bowl-shaped شكل وعاء | feathers ريش | amplify تضخيم | direct توجيه

Activity 5 The Nervous System

- Senses work together with the nervous system to gather information from the environment.
- Mammals such as humans, elephants and dogs have the same structure of nervous system.

The nervous system consists of :

- The brain.
- The spinal cord.
- Nerves.



Human nervous system

The brain

It is connected to the spinal cord.

Its function :
It is the main control center in the body.

The spinal cord

- It is a big nerve that runs through the backbone.
- It is branched into smaller and smaller nerves.

Its function :
It carries messages from the brain to the body parts and vice versa.

Nerves

Nerves are distributed throughout the body and connect the sense organs and the body parts with the brain.

Their function :
They carry messages from the brain to the spinal cord and other parts of the body and vice versa.

Note :
Some nerves are connected directly to the brain such as the nerves of eyes.

nervous system	الجهاز العصبى	mammals	ثدييات	nerves	أعصاب	distribute	يوزع
gather	يجمع	spinal cord	الحبل الشوكى	backbone	العمود الفقرى	vice versa	العكس صحيح

Notes

1. The nerves transmit information from the sensory organs to the brain.
2. The five sensory organs contain a special type of nerves known as sensory receptors.

Sensory receptors :

They are nerves found in different parts of the body that are responsible for receiving information from the environment.

▸ How does the nervous system work if you smell pizza ?

1. The sense organ (nose) receives the information from the environment which is the pizza's odor.
2. Then the sensory receptors of smell that are found in the back of your nose send specific signals along the nerves to your brain.
3. Once the information about the smell reaches your brain, the brain processes that information and determines the type of the food.

Check your understanding

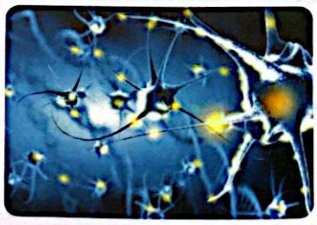
▸ Using the words bellow to complete the following sentences :

(brain – processes – sensory receptors)

Nose

Receive information

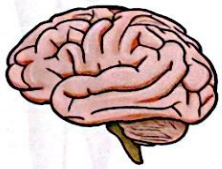
transfer through



Nerves

Transferring

send specific signals to



Brain

Processing

1. The nose contains ..... that receive the odour of the food.
2. The odour transfers to the brain through .....
3. The brain ..... these information and determine the type of the food.

transmit	ترسل	sensory receptors	مستقبلات حسية
odor	رائحة	signals	إشارات

Activity 6 Sensing the Environment

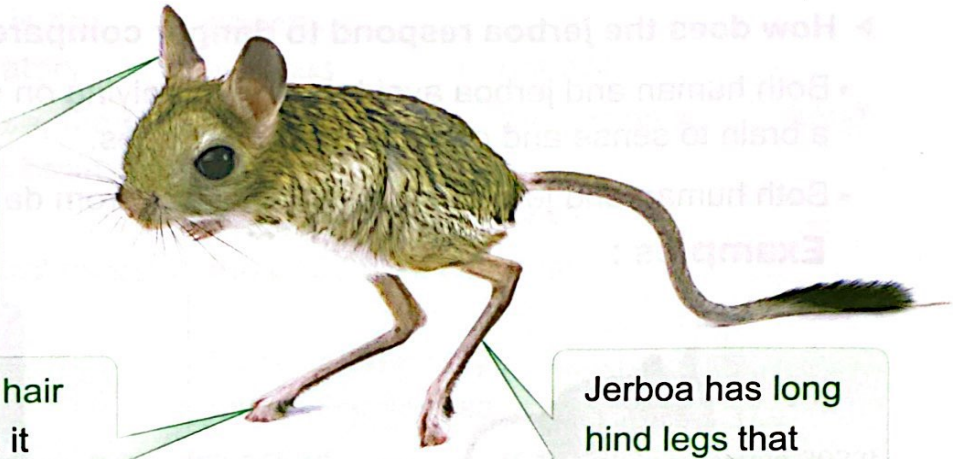
▸ **In this activity, we will learn how structural adaptations and the nervous system work together to help the jerboa survive.**

Jumping jerboa :

- The Egyptian jerboa is a desert rodent.
- It searches for food at night.

▸ **Jerboa adaptations to the environment :**

Jerboa has large and sensitive ears, so it can detect even a quiet snake. (Structural adaption)



Egyptian Jerboa

- Jerboa's feet and toes have hair to help it grip the sand when it hops and jumps.
- It hops in zigzag patterns, so it can escape quickly from danger. (Behavioral adaptation)

Jerboa has long hind legs that enable it to jump a long distance. (Structural adaptation)

▸ **How do all parts of a jerboa's body work together to avoid danger ?**

When a snake makes noise as it comes near a jerboa to hunt it :

1. The sensory receptors in the jerboa's ears send a message through a network of nerves to its brain.
2. The jerboa's brain translates this message and alerts its legs to move.
3. The jerboa's strong hopping legs start to jump away from the danger (the snake) in zigzag paths .

jerboa	حيوان اليربوع	grip	يمسك	hind	خلفية	
rodent	قارض	zigzag patterns	مسارات متعرجة	detect	يحدد	101

- The jerboa's sharp sense of hearing and its strong legs for jumping work together with its nervous system to help it survive.
- The whole response process of the jerboa running away from danger occurs in less than one second. The time taken by a jerboa to react to danger is known as the "reaction time".

Reaction time :

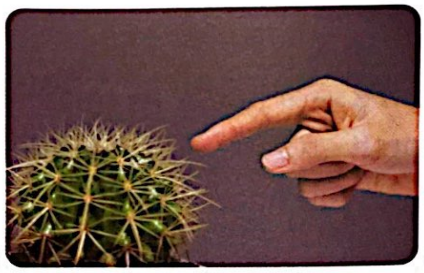
It is the time taken by the body of a living organism to respond and react to different information from the environment (such as danger).

▸ **How does the jerboa respond to danger compared to a human ?**

- Both human and jerboa avoid danger by relying on sensory receptors, nerves and a brain to sense and communicate messages.
- Both human and jerboa move quickly away from danger for their safety.

Examples :

- Jerboa hops in zigzag patterns, so it can escape quickly from danger.



- Human moves quickly his hand away, when it touches the spines of a cactus plant.

Check your understanding

▸ **Put (✓) or (✗) :**

1. When a jerboa feels unsafe, its brain sends messages to its legs through its nervous system to run away from danger. ( )
2. The reaction time is the time taken by a jerboa to respond to danger. ( )
3. Jerboa's hind legs are short to help it jump long distances. ( )

In the Assessment Book :
Try to answer :
Self-Assessment ⑦

alert ينبه/يحذر | reaction time زمن الإستجابة | spines أشواك | cactus الصبار

Exercises on Lesson 2

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. The senses you depend on to find a small radio that produces low sound in a dark room are .....
   a. hearing and smell. b. touch and taste.
   c. smell and taste. d. hearing and touch.
2. The responsible system for moving your hand away from danger, such as touching a hot cup of tea, is the ..... system.
   a. digestive b. respiratory c. nervous d. urinary
3. When snakes make a noise, the sensory receptors found in jerboa's ..... send a warning message to the brain.
   a. ears b. nose c. feet d. teeth
4. The brain is the main control center in the body, so it can deal with ..... at the same time.
   a. two senses only b. three senses only
   c. four senses only d. all the five senses
5. Animals that become active at night are called ..... *(Cairo 2023 / Gharbia 2022)*
   a. diurnal animals. b. nocturnal animals.
   c. extinct animals. d. endangered animals.
6. When your hand touches the spines of a cactus plant, it is withdrawn in .....
   a. less than one second. b. one minute.
   c. two minutes. d. one hour.
7. When a jerboa hears the sound of a moving snake, it .....
   a. remains standing in its place.
   b. jumps to hunt the snake.
   c. makes sounds to frighten the snake.
   d. jumps quickly to run away from the snake.
8. The organ that processes the information collected through the sense of sight is .....
   a. the spinal cord. b. nerves.
   c. the brain. d. eyes.
9. The nervous system of mammals consists of ..... *(Cairo 2022)*
   a. the brain only.
   b. the spinal cord only.
   c. nerves and the spinal cord only.
   d. the brain, the spinal cord and nerves.

10. Both the spinal cord and nerves .....
    a. are located in the brain.
    b. are located in the small intestine.
    c. transmit messages from the brain to all parts of the body only.
    d. transmit messages from the brain to all parts of the body and vice versa.

11. Which of the following choices explains how the body reacts to the smell of food in the correct order ? .....
    a. Brain ⟶ nose ⟶ nerves. b. Nose ⟶ brain ⟶ nerves.
    c. Nerves ⟶ brain ⟶ nose. d. Nose ⟶ nerves ⟶ brain.

12. The correct order for a bat to locate a mosquito using echo, is .....
    a. mosquito makes a sound ⟶ reaches the bat ⟶ returns to mosquito.
    b. bat makes a sound ⟶ reaches a wall ⟶ returns to mosquito.
    c. mosquito makes a sound ⟶ reaches a wall ⟶ returns to mosquito.
    d. bat makes a sound ⟶ reaches the mosquito ⟶ returns to bat.

13. Owls have all the following properties to sense distant preys that make low sounds, except ..... *(Menofia 2022)*
    a. large eyes.
    b. a bowl-shaped face.
    c. a head that turns in all directions.
    d. weak sense of hearing.

14. The owl's large eyes and bowl-shaped face are considered as ..... adaptation.
    a. only structural
    b. only behavioural
    c. both structural and behavioral
    d. neither structural nor behavioral

15. Flying bats don't hit different objects at night because they can .....
    a. see them clearly in darkness. b. touch them.
    c. smell them. d. hear the echo reflected from them.

16. Some animals become active during the night due to the following reasons, except that .....
    a. the night is characterized by the cool weather.
    b. the night is a good time for relaxation and rest.
    c. the night is quiet, so that they can hear preys.
    d. the night is a time when preys are available.

17 . Both bats and mosquitoes are active during night. Which of the following statements is correct ? .....
    a. Both can swim well. b. Both can run fast.
    c. Bats prey on mosquitoes. d. Mosquitoes prey on bats.

2 Choose from column (B) what suits it in column (A) :

(1)

(A)	(B)
1. Bat	a. It is a flying nocturnal animal that can hear the quiet movements of rats.
2. Owl	b. It is a desert rodent that has large and sensitive ears.
3. Jerboa	c. It is a non-flying mammal.
	d. It is a flying nocturnal animal that sound reflects to it after hitting insects.

1. ..... 2. ..... 3. .....

(2)

(A)	(B)
1. Sensory receptors	a. It is the main control center in the body.
2. Nerves	b. They are electrical impulses that reach the brain.
3. Brain	c. It is found in the backbone and helps transmit messages between the body and the brain.
4. Spinal cord	d. They are found on the sensory organs and the first to sense the surrounding environment.
	e.They receive information from the sensory receptors.

1. ..... 2. ..... 3. ..... 4. .....

3 Put (✓) or (✗) :

1. Animals that active during the daytime are called nocturnal animals. ( )
2. The Egyptian jerboa lives in forests. ( )
3. The Egyptian jerboa has large ears which help in sensing the snakes. ( )
4. The owl depends on echo to determine the location of preys within the grass or beneath the snow. ( )
5. A bat makes sounds that hit insects and then bounce back to it, so the bat can locate them. ( )
6. The body senses and systems work separately when animals run away from their enemies. ( )
7. Some animals have abilities that humans do not have, and these abilities are called super sensory adaptations. ( )
8. The sensory receptors in the eyes receive the sound produced by a radio and send it to the brain. ( )

9. The Egyptian jerboa can jump for long distances depending on its long hind legs. *(Kafr El-Sheikh 2022)* ( )
10. Hopping of the jerboa in zigzag patterns to run away from danger is considered as a structural adaptation. ( )
11. The spinal cord is the main control center of the body, which helps carry messages from and to the brain. ( )
12. The heart and eyes are connected to the brain through blood vessels that transmit information in the form of electrical impulses. ( )
13. The large ears of jerboa is an example of structural adaptation. ( )
14. The habitat of the jerboa is similar to that of the polar bear. ( )
15. The tongue is the sensory organ responsible for taste, which sends messages to the brain to be processed, then identifying the food type. ( )

4 Write the scientific term of each of the following :

1. A group of different animals that look for their preys at night. (.....)
2. A desert rodent with a small body, large ears and long hind legs. (.....)
3. A property by which a bat can locate its prey insects through the sound reflected from them. (.....)
4. An animal that can turn its head backwards, and has a bowl-shaped face and large eyes. *(Giza 2022 / Cairo 2023)* (.....)
5. A system that controls all the body functions, and nerves are one of its parts. *(Cairo 2022)* (.....)
6. The organ responsible for processing information transmitted to it. (.....)
7. An organ composed of a group of nerves located in the backbone, and sends messages from and to the brain. (.....)
8. Organs include the eyes, nose, ears, tongue and skin, and they receive information from the surroundings and send it to the brain. (.....)
9. A type of nerves in the sensory organs that is responsible for receiving information from the environment. (.....)
10. The time taken by an organism's body to respond to different reactions. *(Sharkia 2022 / Luxor 2023)* (.....)

5 Complete the following sentences :

1. Echolocation is used by some animals such as ..... and .....
2. The brain is connected to a group of nerves that passes through the backbone which is known as the .....

3. Hopping of the Egyptian jerboa in zigzag patterns is considered as a ..... adaptation.
4. Owls can detect the places of their preys by using the sharp senses of ..... and ..... *(Cairo 2023)*
5. An owl can see everywhere by turning its ..... in all directions, while a chameleon can see everywhere by moving its ..... in opposite directions.
6. The presence of hair on a jerboa's feet and toes is a ..... adaptation.
7. If you see a cat, you have received this information through the sensory receptors in your ....., then the nerves send a signal to your ..... to identify it.
8. The Egyptian jerboa and the fennec fox have an excellent sense of ....., where both of them have large .....
9. The Egyptian jerboa has long ..... to help it jump for long distances, and it has hair on its feet and toes to help it .....
10. When hearing an alarm ring, the sensory receptors that are found in the ..... send a message through a network of nerves to the ..... which determines what to do to avoid danger.
11. When the Egyptian jerboa is in danger, it starts to run away, this action occurs in a very short time called the .....

6 Correct the underlined words :

1. The <u>digestive</u> system delivers messages through a network of nerves around all body parts. (.....)
2. The long hind legs of jerboa are considered as <u>behavioral</u> adaptation. *(Damitta 2022)* (.....)
3. The spinal cord passes through the <u>mouth</u>. (.....)
4. The organ that is responsible for receiving, processing and responding to information is the <u>heart</u>. (.....)
5. A jerboa's feet and toes are covered with <u>feathers</u>. (.....)
6. The sense of sight of owls is <u>weaker</u> than that in bats. (.....)
7. When your hand touches the spines of cactus plant, you move it away <u>slowly</u>. (.....)
8. Tongue is the sensory organ that is responsible for <u>smelling</u> sour lemon. (.....)
9. When a bat sends a sound against a wall, it returns to it. This phenomenon is called <u>camouflage</u>. (.....)

7 Give reasons for :

1. Animals that live in hot regions become active at night.

.....

.....

2. Owls have bowl-shaped faces.

.....

.....

3. Bats can catch insects in the dark. *(Sharkia 2023)*

.....

.....

4. Owl is a nocturnal animal.

.....

.....

5. The Egyptian jerboa can jump for long distances.

.....

6. The presence of hair on the Egyptian jerboa's feet and toes.

.....

7. The Egyptian jerboa's ears play a very important role in its survival.

.....

.....

8 What happens if ... ?

1. Bats lose the ability to hear by using echolocation property.

.....

.....

2. Owls cannot turn their heads in all directions.

.....

.....

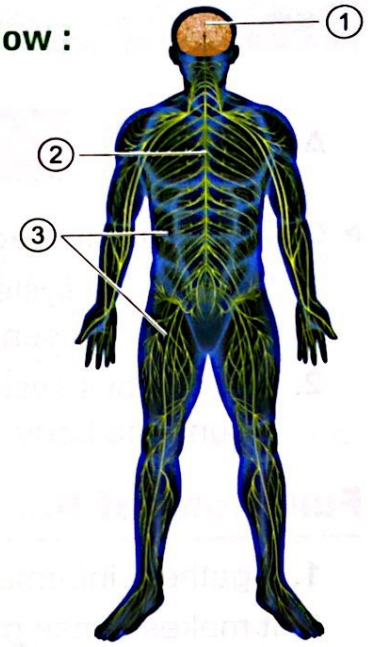
3. Your hand touches the spines of a barbary fig plant.

.....

4. The Egyptian jerboa hears a snake moves towards it.

.....

9 **Look at the opposite figure, then answer the questions below :**



a. What does the figure represent ?

.....

b. Label the figure :

① ..... ② ..... ③ .....

c. Complete :

1. Number (.....) is found inside the backbone of the human body.
2. Number (.....) represents the main control center in the human body.
3. Number (.....) spreads all around the human body parts.

---

10 **Arrange the following sentences according to how the body parts of Egyptian jerboa act to avoid danger:**

(.....) The brain alerts the jerboa's legs to start moving.

(.....) The brain processes the message telling there is a danger.

(.....) A jerboa hears a snake moving towards it.

(.....) The jerboa jumps in zigzag paths to run away from the danger.

(.....) The sensory receptors that found in jerboa's ears send a message to the brain.

LESSON THREE

Activity 7 How the Nervous System Works

▸ **Choose the correct answer from those between brackets :**

1. The nervous system gathers information about what is going on inside and outside the body and sends this information to the ..... (blood vessels – brain)
2. The nervous system is connected by ..... that transmit messages around the body. (muscles – nerves)

Functions of the nervous system :

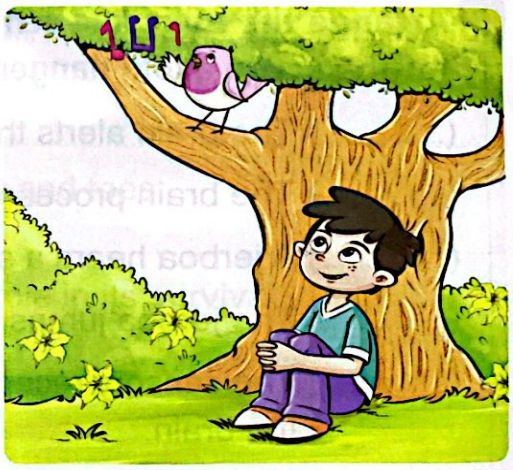
1. It gathers information through the sensory organs like the eyes, ears and skin.
2. It makes sense of (translates) these information through the brain.
3. It tells the body what to do according to these information.

Example:

When the ears pick up sound waves coming from a chirping bird.

The nerves in the ears send a message to the brain, which translates these sound waves.

Then, the brain sends a message to the body about what to do, such as turn to look for the bird on a tree.



Notes

1. Some messages, called **"reflexes"**, are so fast that you cannot realize it such as moving your hand away when touching a very hot cup of tea.
2. Other messages are sent from and to the brain automatically, like the signal to breathe.

Check your understanding

▸ **Complete the following sentences :**

1. The nervous system sends information through ..... to the ..... to be processed.
2. Collecting information about what happens inside and outside the body is one of the functions of the ..... system.

transmit	ينقل	pick up	يلتقط	reflexes	ردود الفعل المنعكسة
muscles	عضلات	chirping	زقزقة		

Activity 8 Describing the Nervous System

From the previous activity, we conclude that :

- The parts of the nervous system work together to :
  - Sense the environment by sensory organs (such as eyes, nose, mouth ... etc.).
  - Process the information to decide the best action by brain.
  - Send messages to the body parts by nerves to react to these information.
- Without all of the parts of the nervous system, the person might not receive, send or react to the information.

Check your understanding

Read the sentences that describe the nervous system, then write the correct term from the word bank in each blank :

brain – reflexes – nerves – spinal cord – sensory receptors.

1. The ..... is like the command center for your body.
2. The big nerve that passes through the backbone is called the .....
3. Messages are carried by ..... to and from the brain.
4. Messages sent by the nervous system that are often so fast that you do not think about them are called .....
5. The ..... are the nerves that lie in different places of the body and are responsible for receiving information from the environment.

In the Assessment Book :
Try to answer :
• Self-Assessment (8)

process يعالج receive يستقبل

Exercises on Lesson 3

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. Your sensation of hot weather depends on sensory receptors in the .....
   a. eyes. b. nose. c. ears. d. skin.
2. Recognizing thunder and lightning depends on the senses of .....
   a. hearing and sight. b. sight and smell.
   c. hearing and touch. d. hearing and taste.
3. Closing your eyes quickly when strong light rays fall on them suddenly represents .....
   a. inhalation. b. reflex.
   c. countershading. d. camouflage.
4. The nervous system gather information from the environment through ..... and then process them by .....
   a. brain – nerves. b. nerves – sensory organs.
   c. sensory organs – brain. d. spinal cord – brain.
5. You opened the door of your house when you heard the doorbell. Which of the following statements explains the sequence of messages inside your body in this situation ? .....
   a. Ears → brain → hand. b. Ears → hand → brain.
   c. Brain → ears → hand. d. Brain → hand → ears.
6. You pass the football to a player in your team. Which of the following statements explains the sequence of messages inside your body in this situation ? .....
   a. Feet → nerves → brain. b. Nerves → brain → feet.
   c. Nerves → feet → brain. d. Brain → nerves → feet.
7. If you smell smoke from something burning nearby, then you realized you had to move away fast. This means that there is an integration between the ..... in this situation. *(Alexandria 2022)*
   a. digestive system and respiratory system
   b. digestive system and nervous system
   c. respiratory system and nervous system
   d. nervous system and urinary system
8. All the following are from the importance of the nervous system in mammals, except .....
   a. gathering information.
   b. pushing blood through blood vessels.
   c. sending signals to the body parts to react.
   d. translating information.

2 Put (✓) or (✗) :

1. The brain sends automatic signals so that we can breathe. ( )
2. Blinking when something becomes near to your eyes is an example of reflexes. ( )
3. Parts of the nervous system work together to gather and process information, then send signals. ( )
4. Your fingers send signals to the brain to distinguish between smooth and rough objects. ( )
5. Sensory organs are responsible for processing information. ( )
6. The function of the digestive system is distinguishing between hot and cold things. ( )
7. The nerves inside the body connect all parts of the nervous system together. ( )

3 Write the scientific term of each of the following :

1. It delivers messages between the spinal cord and different body organs. (.....)
2. The organs that receive information from the surrounding environment. (.....)
3. The sensory organ that can distinguish between sharp and rough voices. (.....)
4. A sense by which you can recognize the sour taste of lemon. (.....)
5. They are messages sent by the nervous system that are often so fast that you cannot realize them. (.....)

4 Complete the following sentences :

1. The ..... is the organ that sends information to the brain when you smell a perfume.
2. The spinal cord is a big ..... that passes through the ..... of the human body.
3. If you come near your dog, its nose sends a message through the nerves to its ..... alerting it that you are coming.
4. When you touch a very hot object, your hand moves away quickly, this action is known as ..... *(Giza 2022)*
5. When you hear a train horn, ... in the ears send a message through a network of nerves to reach the .....
6. The ..... is the organ that is responsible for gathering surrounding sounds, while the ..... is the organ that is responsible for gathering different odors.
7. When an owl hears the sound of a prey, sensory receptors in the ..... send information through nerves to the ..... to be processed.
8. When someone cannot hear clearly, this means that he has a problem in his ..... sense.

5 Correct the underlined words :

1. The muscles in the sensory organs within your body are responsible for receiving information from the surrounding environment. (.....)
2. When your eyes are closed, you can distinguish between your brother's voice and your friend's voice, depending on your sense of sight. (.....)
3. The spinal cord is responsible for processing sound waves coming through ears. (.....)

6 Cross out the odd word :

1. Smell – Taste – Eyes – Hearing. (.....)
2. Eyes – Nose – Skin – Taste. (.....)
3. Spinal cord – Lungs – Nerves – Brain. (.....)

7 Give reasons for :

1. Humans can recognize the sounds of different musical instruments.

.....

2. The brain has an important function in the nervous system.

.....

8 What happens if ...?

1. The spinal cord became absent from the components of the nervous system.

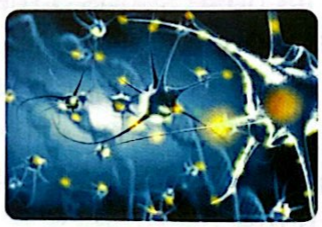
.....

2. Sensory receptors related to the eyes stopped sending messages to the brain.

.....

9 Look at the following figures, then complete the following sentences :

Part ①



Part ②

Part ③

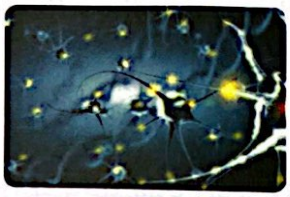
1. These body parts belong to the ..... system.
2. When you touch a freezing bottle of water, part number ..... in your hand sends a message through part number ..... to reach part number ..... which tells you that this bottle is very cold.

10 **You have some pictures of different parts of the human body. Write down the organ number in front of the system to which it belongs in the following table :**

①

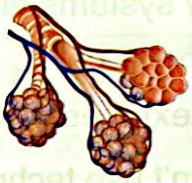
②

③



④

⑤



⑥

System	Organ
1. Digestive system :	.....
2. Respiratory system :	.....
3. Nervous system :	.....

LESSON FOUR

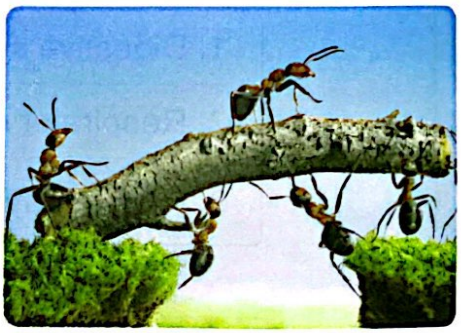
Activity 9 How Animals use Communication Systems

▸ **Put (✓) or (✗) :**

1. Humans only can communicate with each other by sounds. ( )
2. Some animals produce different sounds to send messages to each other. ( )

- Technology systems allow humans to communicate with each other through :
  - Making phone calls.
  - Sending text messages and e-mails.
- Animals don't use technology systems as we do, but they can still use other systems to communicate with each other.
- We will study ants and humpback whales as examples of these animals.

Ants :



- Ants live in colonies that contain thousands of individuals.
- Groups of ants within a colony have different roles, where they have developed systems that help them divide their work among themselves, so there are nurse ants, scout ants and soldier ants.

How do groups of ants communicate with each other ?

When the food is low, nurse ants send smelly messages to scout ants which are responsible for locating food.

The scout ants respond by sending a smelly message to alert the ants where to find the food.

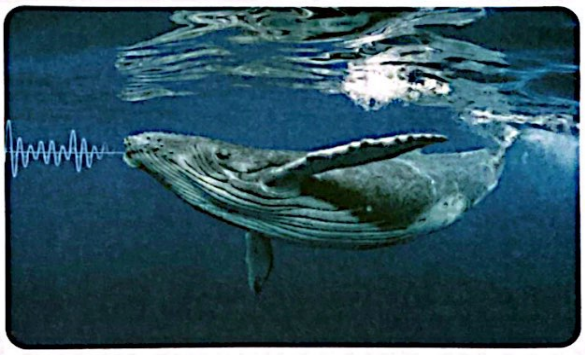
Note

The soldier ants also use smelly messages to communicate if there is danger nearby.

calls	مكالمات	developed systems	أنظمة متطورة	nurse ants	عاملات النمل	nearby	قريب / مجاور
scout ants	النمل الكشاف	individual	فرد	soldier ants	جنود النمل	responsible for	مسئول عن
colonies	مستعمرات	role	وظيفة / دور	alert	تحذر / تنذر		

Humpback whales :

- Humpback whales sing under water to communicate with each other, where they sing a wide range of notes (tones) and a series of songs.
- The songs of humpback whales have different sounds depending on the season, where :



In winter	In summer
- It is the mating season. - Their songs have high-pitched sounds which travel better through cold water.	- It is the feeding season. - Their songs have low-pitched sounds which travel better through warm water.

Notes

1. High-pitched sounds such as the sharp voice of a woman.
2. Low-pitched sounds such as the rough voice of a man.

Check your understanding

▸ Complete :

1. When the food is low, ... ants send ..... to ..... ants which are responsible for locating food.
2. The ..... ants use smelly messages if there is danger nearby.

▸ Choose the correct answer :

1. The rough sound of humpback whale is ..... pitched sound.
   a. high b. low c. soft
2. The songs of humpback whales have a ..... pitch in winter.
   a. higher b. lower c. rough

series	سلسلة / متوالية	sharp	رفيع / حاد	low-pitched sound	صوت منخفض الحدة		
mating	التزاوج	feeding	التغذية	rough	خشن / غليظ		

Activity 10 S T E M in Action

Technology Inspired by Nature

- **Bats use sound in some purposes such as :**
  - Communicating with each other.
  - Getting information about their surroundings using their hearing sense.

How does the bat use its ears for echolocation to get information about its surroundings in the dark ?

1. Bat makes a high-pitched sound.
2. The sound hits something nearby the bat and reflects back to it in the form of "echo".
3. Bat listens for the echo (reflected sound).
4. So, bat knows that there is something nearby.

Bat Inspired technology :

- Scientists have been inspired (get benefited) by the adaptation of bat echolocation to find ways to help **blind people** detect their surroundings, where :

Scientists have created a **special cane** that emits a high-pitched sound just like bats do.

As a blind person is walking with this special cane, an echo of this high-pitched sound is picked up by this special cane.

The echo is turned into vibrations that the person can feel with his thumb.

The vibrations of the special cane tell the blind person the direction of the obstacles and objects around him.

inspired مستوحاه obstacles عوائق special cane عصا خاصة

Note

Humans cannot hear the high-pitched sounds produced either from bats or the special cane of blind people.

▸ **In this table we can summarize the similarities and differences between the special cane of blind person and bat echolocation.**

Special cane of blind person	Bat
Similarities	
- The special cane of blind person and bats emit a **high-pitched sound** that bounces off objects as an echo. - This special cane and bats **receive the echo** that can tell how far away objects are.	
Differences	
- This special cane picks up an echo from the sound it emits and **changes** it into a vibration that can tell the blind person where objects are around him.	- Bats pick up an echo from the sound they emit but they **don't change** it into vibrations.

Check your understanding

▸ **Put (✓) or (✗) :**

1. Bats make low-pitched sound and then listen for an echo. ( )
2. Bats can change the echo into vibrations. ( )

Review on Concept (1.2)

To review this concept look at the **Assessment Book** "**Part 2 :** Final Revision".

In the Assessment Book :

Try to answer :

- Self-Assessment (9)
- Model Exam on Concepts (1.1) & (1.2)

similarities تشابهات differences اختلافات

Exercises on Lesson 4

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. Sending smelly messages when there is a shortage of food is the role of .....
   a. queen ants. b. nurse ants. c. scout ants. d. soldier ants.
2. Locating food is the role of .....
   a. queen ants. b. nurse ants. c. scout ants. d. soldier ants.
3. Alarming the colony from dangers is the role of .....
   a. queen ants. b. nurse ants. c. scout ants. d. soldier ants.
4. Humpback whales sing during ..... months, which is the mating season.
   a. winter b. summer c. spring d. autumn
5. Sense organs collect information and send signals to ..... for processing and understanding. *(Port Said 2022)*
   a. hands b. legs c. brain d. stomach
6. Bats use their ..... to get information about their surroundings in the dark.
   a. nose b. tongue c. eyes d. ears *(Gharbia 2022)*
7. Echolocation in some animals is the use of ..... pitched sounds for finding food.
   a. medium b. low c. very low d. high
8. ..... use echolocation by bouncing high-pitched sounds in the air.
   a. Bats b. Dolphins c. Whales d. Snakes *(Alex. 2023)*
9. The echo is turned into ..... that a blind man can feel in his thumb while holding his special cane.
   a. vibrations b. light c. heat d. water
10. The blind person's cane and ..... emit a high-pitched sound that bounces off objects forming an echo.
    a. lizards b. polar bears c. bull sharks d. bats
11. Songs of humpback whales in winter are characterized by each of the following except .....
    a. having high-pitched sounds. b. travelling better through cold water.
    c. having soft sounds. d. having low-pitched sounds.
12. All the following sentences describe humpbacks' life, except .....
    a. they can communicate in cold and warm water.
    b. they mating in winter months.
    c. they have a weak hearing sense.
    d. they communicate with each other through sounds.

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Nurse ants 2. Scout ants 3. Soldier ants	a. are responsible for reproduction and laying eggs. b. are responsible for warning from dangers. c. are responsible for locating food. d. are responsible for sending smelly messages when the amount of food decreases.

1. ..... 2. ..... 3. .....

3 Put (✓) or (✗) :

1. It is impossible to design technology inspired by the adaptations of some living organisms around us. ( )
2. A special cane is invented to help a person who has lost the sense of hearing. ( )
3. The sound pitch from a blind person's cane is too high for humans to hear. ( )
4. Echo is turned into light that a blind man can feel while holding his special cane. ( )
5. Bats have the ability to change echo into vibrations just as the canes of blind persons do. ( )
6. Animals use technological systems as we do. ( )
7. Animals communicate with each other by using different senses. ( )
8. Humpback whales communicate with each other through flashing. ( )
9. Humpback whales produce more than one type of songs. *(Giza 2023)* ( )
10. Humpback whales can sing under water. ( )
11. Sense organs can decode the information that is sent by the brain. ( )

4 Correct the underlined words :

1. Groups of ants within a colony have <u>similar</u> roles. (.....)
2. <u>Scout</u> ants are responsible for alarming the colony in danger. (.....)
3. Humpback whales have <u>similar</u> sounds according to the season. (.....)
4. Humpback whales produce low-pitched sounds in <u>winter</u>. (.....)
5. <u>Low</u>-pitched sounds travel better through cold water. (.....)

5 Write the scientific term of each of the following :

1. A season in which the humpback whale produces high-pitched sound. (.....)
2. A season in which the humpback whale produces low-pitched sound. (.....)

3. Small living organisms that live in colonies and communicate with each other by smelly messages to perform different roles. (.....)
4. A group of ants which is responsible for sending smelly messages when there is a shortage of food. *(Alex. 2023)* (.....)
5. Pitched sounds which travel through cold water better than through warm water. (.....)
6. Pitched sounds which travel through warm water better than through cold water. (.....)
7. Sense organ that can detect sound energy. (.....)
8. Sense organ that can detect light energy. *(Giza 2022)* (.....)
9. A living organism that can fly and depend on the echolocation property to get information about its surroundings in the dark. (.....)
10. A simple tool (device) used by blind people to walk safely. (.....)

6 Complete the following sentences :

1. Bats and the special cane of blind people are similar in using ..... property to locate objects.
2. A group of ants sends ..... messages to communicate with each other.
3. Ants use their sense of ..... to communicate with each other.
4. Ants within a colony are divided into several groups such as ..... ants, ... ants and ..... ants, where each group do a specific role.
5. Humpback whales communicate with each other by using the sense of ..... , where they sing a wide range of ..... and a series of .....

(Minia 2023)

6. In winter months, the songs of humpback whales have ..... pitched sound, because these sounds travel better through ..... water.
7. In ..... months, the songs of humpback whales have ..... pitched sound, because these sounds travel better through warm water.
8. Humans can communicate with each other where ears of human detect ..... energy and eyes of human detect ..... energy.
9. Ants are similar to the ..... tree in that both of them send a smelly messages for communication.
10. The echo that is picked up by the special cane of a blind person is turned into ..... that the person can feel them with his thumb.

7 Give reasons for :

1. The nurse ants send smelly messages to scout ants.

.....

2. The soldier ants use smells in their communication.

.....

3. The songs of humpback whales have high-pitched sounds during winter months.

.....

4. Humpback whales sing different songs.

.....

5. The echo that is picked up by the special cane of blind people is turned into vibrations.

.....

6. The blind people cannot hear the sound that emits from their special canes.

.....

8 What happens if ... ?

1. The smell sense of ants becomes weak.

.....

2. The amount of food in the ants colony decreases.

.....

3. There is a danger near to an ants colony.

.....

4. High-pitched sound that is produced by the blind person's cane hits an object.

.....

5. Bats cannot use echolocation property.

.....

6. There is a wall in front of a blind person uses his special cane.

.....

7. The hearing sense of humpback whales becomes weak.

.....

Model Exam 1 on Concept (1.2)

Total mark: 15

1 (A) Choose the correct answer : *(5 marks)*

1. Senses that can distinguish between milk and water are .....
   a. taste and sight.
   b. smell and hearing.
   c. sight and hearing.
   d. taste and hearing.
2. Bats can fly without hitting walls because they can .....
   a. hear the echo reflected from them.
   b. touch them.
   c. see them clearly at night.
   d. smell them.
3. When your hand touches the spines of a cactus plant, it is withdrawn in .....
   a. one minute.
   b. two minutes.
   c. more than one hour.
   d. less than one second.
4. Brain, nerves and sensory receptors are parts of the nervous system, where .....
   a. only sensory receptors work individually.
   b. only the brain works individually.
   c. they work together with each other.
   d. they work separately from each other.

(B) Give a reason for :

The Egyptian jerboa has long hind legs.

.....

2 (A) Correct the underlined words : *(5 marks)*

1. When you hear the fire alarm, your <u>eyes</u> send a signal to the brain. (.....)
2. The <u>spinal cord</u> is responsible for processing the information coming through ears. (.....)
3. The dog has sharp senses of smell and <u>taste</u>. (.....)
4. The sense of sight in bats is <u>stronger</u> than that in owls. (.....)

(B) What happens if ... ?

Owls cannot turn their heads in all directions.

.....

.....

3 **(A) Write the scientific term of each of the following :** *(5 marks)*

1. A living organism that can fly and depend on the echolocation property to get information about its surroundings in the dark. (.....)
2. A season in which the humpback whale produces low-pitched sound. (.....)
3. Sense organ that can detect light energy. (.....)
4. A group of messages sent by nervous system that are often so fast that you cannot realize them. (.....)

(B) Mention two devices that humans can use to communicate with their surroundings, where their ideas are inspired from some animal adaptations. And then mention the name of these two animals.

Devices	Inspired from the adaptation of
1.	.....
2.	.....

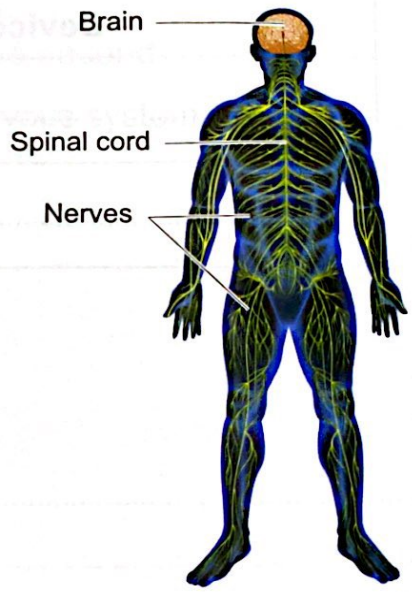
Model Exam 2 on Concept (1.2)

Total mark: 15

1 (A) Write the scientific term of each of the following : *(5 marks)*

1. The time taken by an organism's body to respond to different information around it. (.....)
2. A sense by which you can recognize the sour flavor of vinegar. (.....)
3. A system that controls all the body functions and nerves are one of its parts. (.....)
4. The organ which receives and processes the messages sent from the sensory receptors that are found in a jerboa's ears. (.....)

(B) Look at the opposite figure that shows the structure of the human nervous system, then answer the questions :



1. Which part spreads all around the human body ?
   .....
2. Which part is found inside the backbone of the human body ?
   .....
3. Which part represents the main control center in the human body ?
   .....

2 (A) Complete the following sentences : *(5 marks)*

1. The ..... is the organ that sends information to the brain when you smell the scent of a perfume.
2. Ants use their sense of ..... to communicate with each other.
3. Hopping of the Egyptian jerboa in zigzag patterns is considered as a ..... adaptation.
4. Owls can detect the places of their preys by using the super senses of ..... and .....

(B) Order the following statements which explain how the brain processes information :

(.....) The brain sends a signal to the muscles to move to start the race.

(.....) Hearing the whistle sound to start the race.

(.....) The brain processes information.

(.....) The nerves of the ears send a signal to the brain.

---

3 (A) Put (✓) or (✗) : *(5 marks)*

1. Animals use technological systems as we do. ( )
2. Humpback whales communicate with each other through flashing. ( )
3. The sound pitch from a blind person's cane is too high for humans to hear. ( )
4. Echolocation is a type of communication between owls. ( )

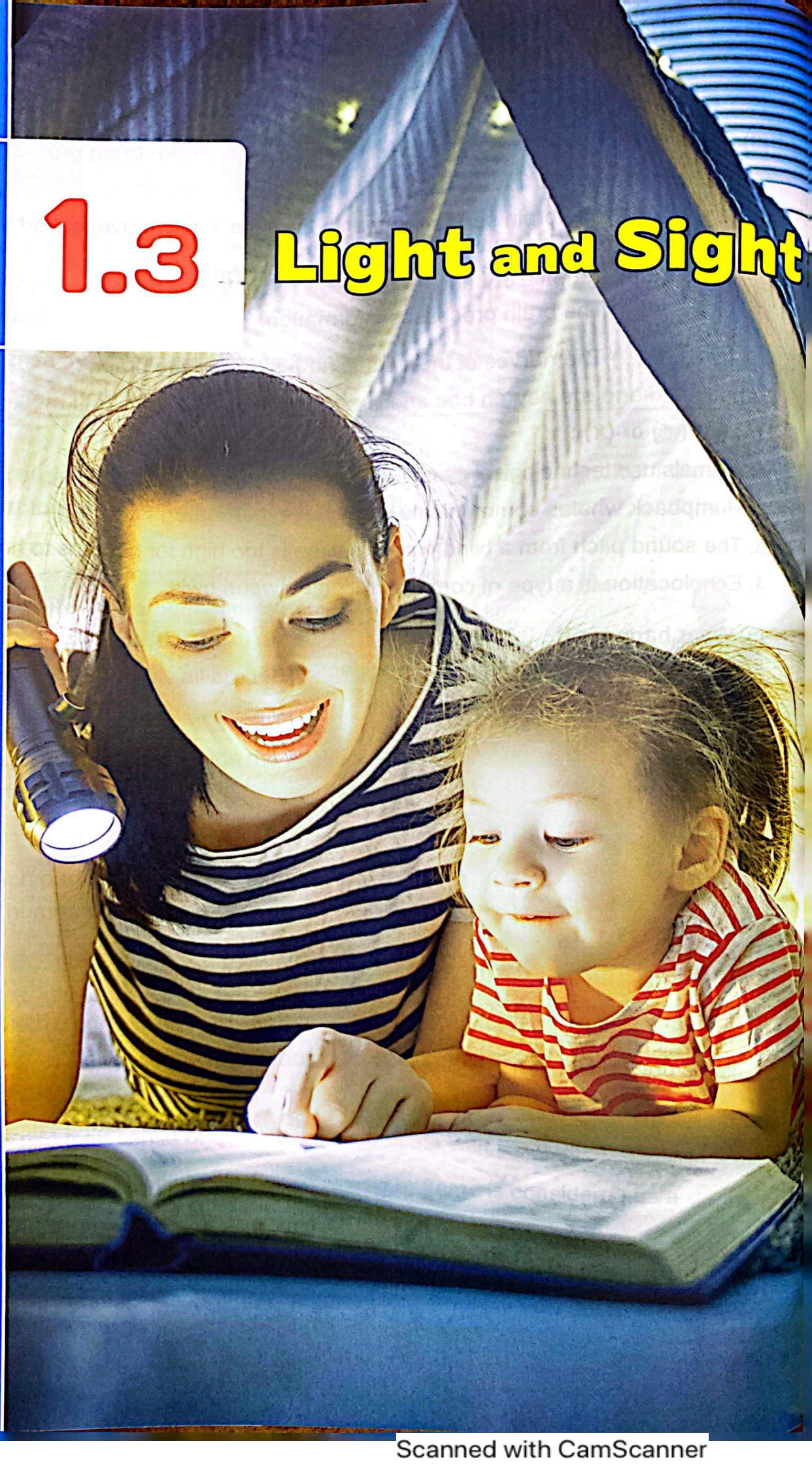
(B) What happens if ... ?

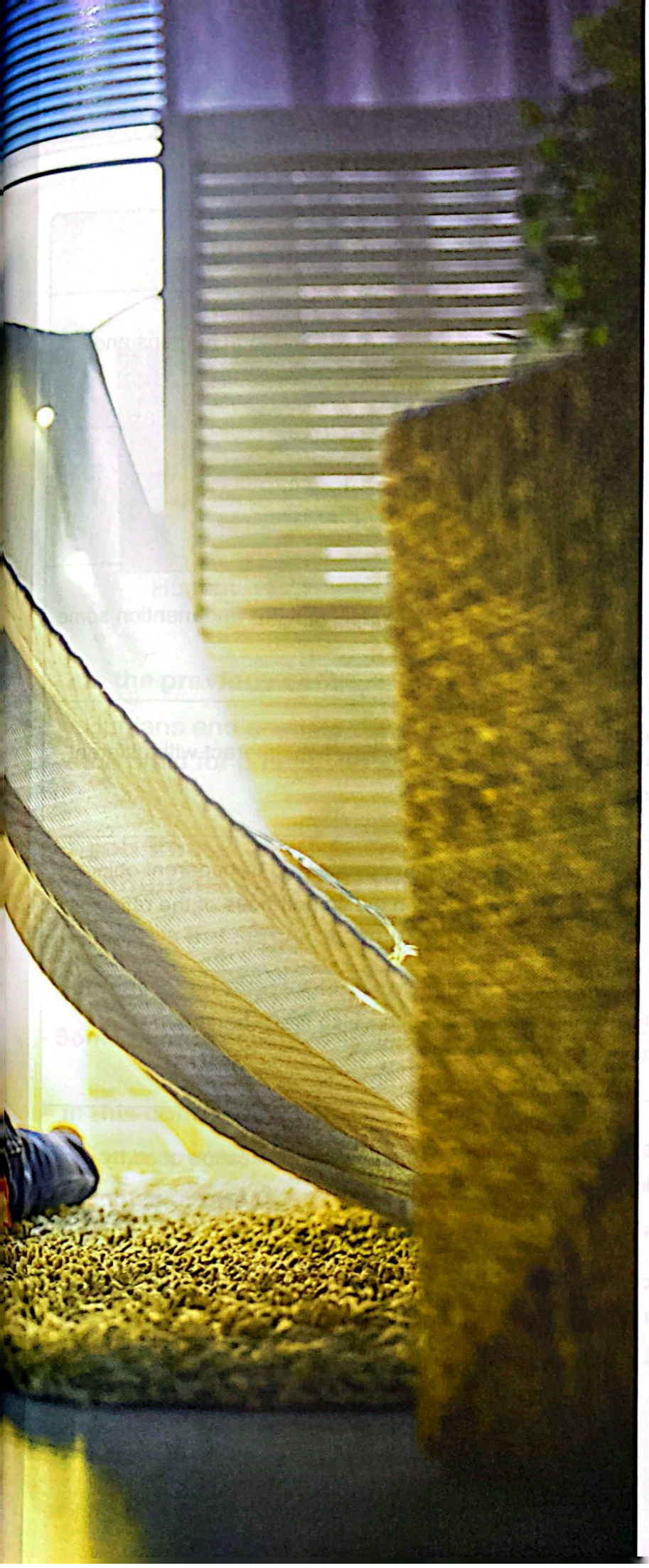
The amount of food in ants colony decreases.

.....

Concept

1.3 Light and Sight





Learning outcomes

By the end of this concept, your child will be able to :

- Describe how light transfers energy across distances.
- Develop a model that describes how the behavior of light enables the eye to see objects.
- Explain how adaptations help some animals gather information in the dark.
- Argue, using evidence that light allows for the transfer of information through systems communication.

Key vocabulary

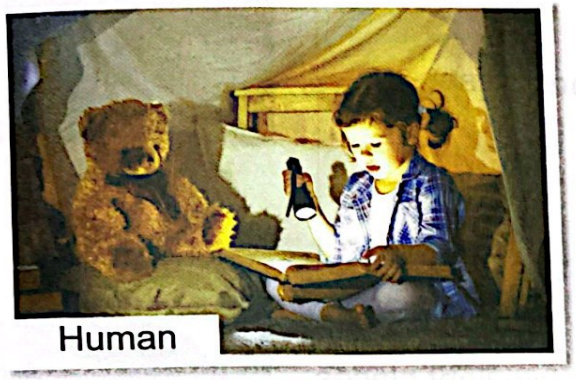
- Feature
- Light
- Matter
- Opaque
- Eye pupil
- Reflection
- Transparent
- Transferring information

Notes For Parents On Concept [1.3]

Lessons	Activities	What you should do with your child
1	Activity 1	Discuss with your child how the vision process occurs in humans and animals.
	Activity 2	Discuss with your child how humans and fishing cats see things in low-light places.
	Activity 3	Explain to your child the meaning of "sources of light" and mention some examples of them.
2	Activity 4	Let your child do an experiment to know how light interact with different types of materials.
	Activity 5	Discuss with your child the meaning of opaque and transparent objects, and how the reflected light depends on the smoothness of the reflecting surface.
3	Activity 6	Discuss with your child the way through which firefly beetles communicate.
	Activity 7	Let your child classify the different types of communication used by humans, animals or both of them.
4	Activity 8	Explain to your child the meaning of “code” that humans can use to transfer information.

LESSON ONE

Activity 1 Can You Explain ?


Human


Fishing cat

- **In the previous concept,** you have learned that animals have senses like humans.
- Humans and animals have nerves that send information from the sense organs to the brain for processing information.

Do you know what is the organ that is affected by light in humans and animals and how they can see things in low-light places ?

- **The eye** is the sense organ of sight that is affected by light in humans and animals.
- **Humans** need more light in low-light places to see clearly.
- **Some animals** such as fishing cat can see better than humans in the low-light places.

In this concept, we will study :

- Some animals that can hunt in the low-light places.
- Light is a form of energy.
- Some special structures in the eyes of some animals.
- Reflection of light.
- How we can see different objects around us.
- How some living organisms use light in communication.

affected by تتأثر بـ information معلومات

Activity 2 Hunting with Night Vision

Look at the opposite picture, then put (✓) or (✗) :

1. Eye is the sense organ that humans depend on to see the surroundings. ( )
2. Presence of sound is important for humans to see the surroundings clearly. ( )

Night vision in humans :

Night vision goggles

- Human eyes need more light to see well in the low-light places.
- Without more light humans would need a device known as "night vision goggles" to see in the dark.

Night vision in animals :

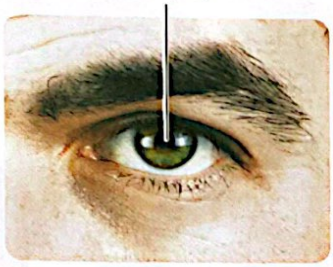
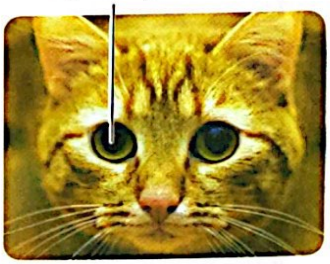
- The structure of eyes of some animals help them see in the dark such as the fishing cat.

The fishing cat

- It is a wild cat and considered as one of nocturnal animals that hunts for food at night.
- The fishing cat's eyes seem to glow in the dark because :
  1- It has a mirror-like membrane at the back of its eyes.
  2- When the light enters the fishing cat's eyes, it bounces (reflects) off this membrane, allowing its eyes to collect more light.
- This structural adaptation of the fishing cat's eyes, is found in all cats and allow them to have excellent night vision to hunt in the low-light places.

clearly	بوضوح	wild	برى	reflected off	ينعكس
surroundings	الأشياء المحيطة	hunt	يصطاد	excellent	ممتاز
night vision goggles	نظارات الرؤية الليلية	mirror-like membrane	غشاء يشبه مرآة		

The ability of humans and nocturnal animals to see in the dark :

Points of comparison	Humans	Nocturnal animals
• Size of the eye :	Small eye	Big eye
• Eye pupil :	Opens narrower eye pupil  Human eye	Opens wider (to allow more light enter their eyes) eye pupil  Cat eyes

Note

Some nocturnal animals can see in the weakest light levels, but in complete darkness they depend on other senses such as hearing and smelling that help them to hunt their preys and to avoid their predators.

What happens if ... ?

The fishing cat eyes have no mirror-like membrane.

It cannot see clearly and hunt at nights.

Check your understanding

Put (✓) or (✗) :

1. The type of adaptation in the fishing cat to see in the low-light places is a behavioral adaptation. ( )
2. All cats have a mirror-like membrane in their eyes. ( )

Choose the correct answer :

If the human eyes contain a mirror-like membrane, so his eyes ..... in the low-light places.

a. gather low amount of light
b. need a night vision goggles
c. appear black
d. appear bright

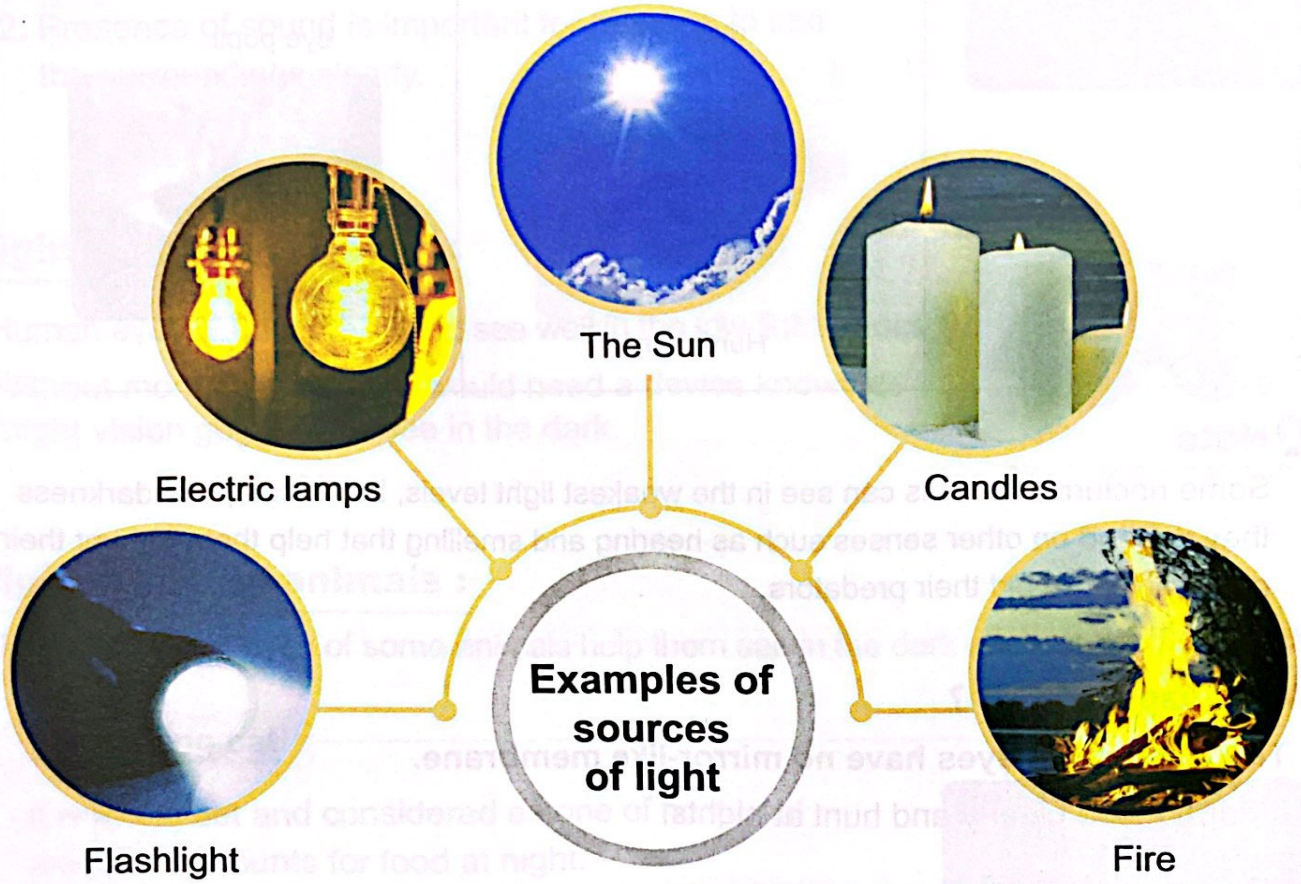
eye pupil بؤبؤ العين/إنسان العين wider أوسع

Activity 3 What Do You Already Know About Light and Sight ?

Sources of light :

A source of light :

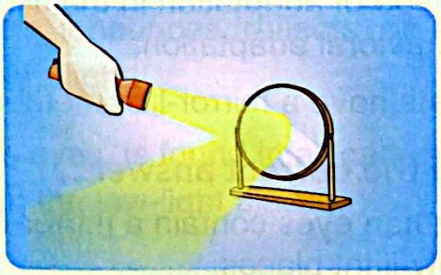
It is something that emits (gives off) its own light.



Note

There are other objects that don't emit light, but they reflect the light falling on them, so they are not considered as sources of light such as :

The moon (reflects the sunlight)

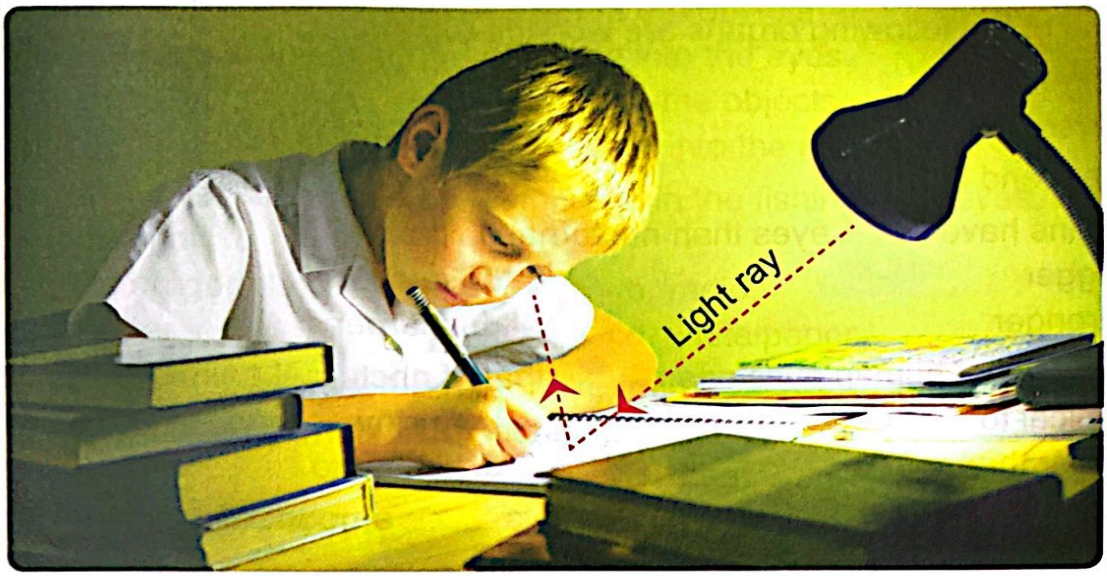


The mirror (reflects the flashlight)

emit يشع reflect يعكس

How we see :

When the source of light emits its own light rays they fall on objects, the light rays bounce off these objects and reach our eyes, so we can see these objects, as shown in the picture below :



From the previous explanation we conclude that :

Light :

It is a visible form of energy that travels in the form of waves.

Note

In complete darkness, we can't see anything because without light bouncing off the objects into our eyes, everything will look black.

Check your understanding

▸ **Complete :**

There are many sources of light such as ..... , ... and .....

▸ **Put (✓) or (✗) :**

1. The light falling on objects bounces back to reach the eye so that we can see these objects. ( )
2. The moon is considered a source of light, so it appears bright at night. ( )

In the Assessment Book :
Try to answer :
Self-Assessment ⑩

bounce off يرتد rays أشعة

Exercises on Lesson 1

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. Which of the following organs are working together for seeing different objects ? ..... *(Kafr El-Sheikh 2022)*
   a. Nose and brain. b. Eyes and brain.
   c. Ears and brain. d. Tongue and brain.
2. Humans have ..... eyes than nocturnal animals.
   a. bigger b. smaller
   c. stronger d. sharper
3. The pupils of human eyes open ..... that of nocturnal animals.
   a. typical to b. narrower than
   c. wider than d. similar to
4. The wide eye pupils of fishing cat, allows ..... amount of light to enter its eyes than those of human eyes.
   a. little b. large c. very small d. small
5. Nocturnal animals depend on all the following senses to find out their preys at night, except .....
   a. sight sense. b. hearing sense.
   c. taste sense. d. smelling sense.
6. The mirror-like membrane of the fishing cat is present .....
   a. inside the stomach. b. at the back of the brain.
   c. inside the lungs. d. at the back of the eye.
7. Which of the following do not need a big amount of light to see in the dark ? .....
   a. Both humans and cats. b. Neither humans nor cats.
   c. Cats only. d. Humans only.
8. To detect the place of a table in a completely dark room, you can depend on .....
   a. sight sense. b. touch sense.
   c. taste sense. d. hearing sense.
9. If someone walking in a dark place without hitting anything around him, so this person may .....
   a. have a big ability to taste. b. have a big ability to breathe.
   c. have a big ability to smell. d. wear a night vision goggles.
10. The character that helps the fishing cat to hunt a prey at night, is its ability .....
    a. to see the sunlight. b. of poor night vision.
    c. to digest its prey easily. d. of excellent night vision.

11. The eyes of fishing cats glow at night, because their eyes .....
    a. emit their own light.
    b. can reflect light.
    c. are small in size.
    d. have narrow pupils.
12. The sight process occurs as follows .....
    a. light falls on the eyes, then reflected to the objects.
    b. light falls on the objects, then reflected into the eyes.
    c. sound falls on the ears, then reflected to the objects.
    d. sound falls on the objects, then reflected into the ears.
13. The function of the mirror-like membrane in the fishing cat's eyes, looks like the function of .....
    a. night vision goggles.
    b. radio.
    c. black paper.
    d. white paper.
14. In the fishing cat's eyes, the mirror-like membrane is an important structure because it helps them to ..... at night.
    a. sleep
    b. breathe
    c. keep their body warm
    d. hunt a prey
15. All the following things are considered as light sources, except .....
    a. the Sun.
    b. fire.
    c. eyes.
    d. the light lamp. *(Cairo 2022)*
16. We can see both the Sun and the moon, because light .....
    a. bounces off both of them.
    b. is emitted from both of them.
    c. bounces off the Sun and is emitted from the moon.
    d. bounces off the moon and is emitted from the Sun.
17. The energy which must present to make our eyes able to see the objects around us is ..... energy. *(Cairo 2022)*
    a. sound b. electric c. light d. magnetic

2 Put (✓) or (✗) :

1. Eyes are considered as sensory organs of light, not as a source of light. ( )
2. Sight is the sense on which humans and animals depend to see the surroundings. ( )
3. Cats have excellent night vision, while humans are not. ( )
4. Both of the moon and the cat's eyes reflect the light that falling on them. ( )
5. The mirror-like membrane that is present at the back of a fishing cat's eyes, is not present in other cat species. ( )
6. We can see the mirror that presents in a completely dark room. ( )
7. Big eyes of fishing cat allow to gather and reflect any little amount of light. ( )

8. If the human has a mirror-like membrane at the back of his eyes, he can see clearly in the low-light places. ( )
9. The light that enters the human eyes allows him to distinguish between weak and strong sounds. ( )
10. The moon is not considered as a light source. *(Cairo 2023)* ( )
11. We can see the moon although it doesn't emit any light. ( )

3 Complete the following sentences using the words below :

(source of light – mirror-like membrane – more light – bounce off)

1. Human eyes need ..... to see clearly in the low-light places.
2. All cats have a ..... at the back of their eyes.
3. Any object that gives off its own light is called a .....
4. We can see objects when the light rays ..... these objects to our eyes.

4 Write the scientific term of each of the following :

1. The organ that is affected by light and responsible for sight. (.....)
2. A species of wild cats, whose eyes glow at night. (.....)
3. Objects that emit their own light. (.....)
4. The organ that is responsible for processing information received by eyes, to know and recognize the surroundings. (.....)
5. A body that appears lighted in the sky, but it is not considered as a source of light. *(Giza 2023)* (.....)
6. A tool that the human can depend on to see in the dark. (.....)
7. The structural adaptation that gives fishing cat an excellent night vision. (.....)
8. The visible form of energy that enables us to see. *(Cairo 2023)* (.....)

5 Correct the underlined words :

1. Humans and cats are <u>similar</u> in their seeing ability at night. (.....)
2. The energy that helps humans and animals see, is the <u>sound energy</u>. *(Minia 2022)* (.....)
3. The <u>moon</u> is one of the light sources in the sky. *(Giza 2023)* (.....)
4. The system that works with the eyes of living organisms for seeing objects is the <u>digestive system</u>. (.....)
5. Cats eyes glow at night due to the presence of a mirror-like membrane at the <u>front</u> of their eyes. (.....)

6. Sound is a visible form of energy that bounces off objects into our eyes. (.....)
7. Eyes send messages to the heart for processing information. (.....)
8. In a completely dark room, everything looks red due to the absence of light. (.....)

6 Complete the following sentences :

1. The fishing cat can hunt at night depending on the excellent sense of .....
2. The fishing cat can hunt at night due to the bouncing off ..... energy.
3. The eyes of fishing cat have a mirror-like membrane bounces off the light, and this is considered as a ..... adaptation. *(Beni-suef 2022)*
4. Eyes of human are ..... than eyes of nocturnal animals, and pupils of nocturnal animals open ..... than that of human.
5. In complete darkness, nocturnal animals depend on other senses such as ..... and .....
6. To see things clearly at night, humans need a source of ..... but ..... animals can hunt at night depending on their excellent night vision.
7. Human can see objects which give off their own light or objects which ..... light.
8. Among the objects which give off their own light are the Sun and ..... , while ..... and ..... are objects that bounce off light.

7 Give reasons for :

1. The fishing cat's eyes seem to glow in the dark.

.....

.....

2. Candle is considered as a source of light.

.....

.....

8 What happens if ... ?

1. The mirror-like membrane in the fishing cat's eyes is not present.

.....

.....

2. The moon can't reflect the sunlight.

.....

.....

9 Cross out the odd word :

1. Flashlight – The moon – Fire. *(Minia 2023)* (.....)
2. The moon – Mirror – Candle. (.....)

10 Study the following three figures, then put (✓) or (✗) :

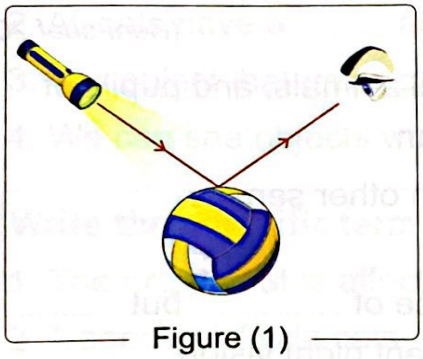


Figure (1)

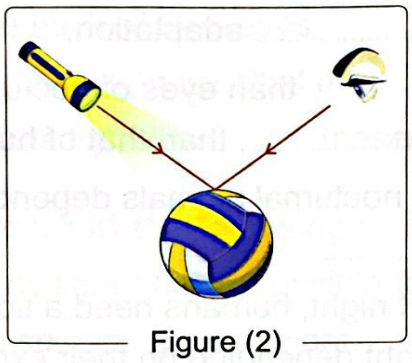


Figure (2)

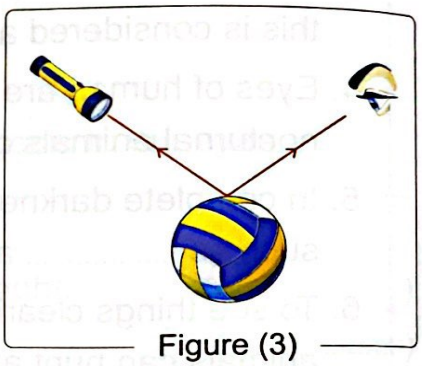


Figure (3)

1. Human's eyes can see the ball in figure (3), because the ball emits light. ( )
2. Figure (2) is not correct, because human's eyes don't emit light. ( )
3. Figure (1) is correct, because the light ray of the flashlight bounces off the ball to the human's eyes. ( )

LESSON TWO

Activity 4 Light Reflection

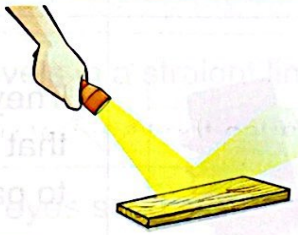
▸ **Choose the correct answer :**

Which one of the following objects is shiny and smooth ? .....

a. Plastic spoon. b. Wooden chair. c. Mirror. d. T-shirt.

In this activity, we will do an experiment that shows how light interacts with different types of materials :

Materials : a flashlight – a mirror – a piece of wood – a piece of plastic – a piece of metal – a piece of cloth – paper.

Steps	Figures	Observations
1. Turn on the flashlight and direct it towards a mirror.		- The mirror reflects most amount of the light.
2. Turn on the flashlight and direct it towards a piece of wood.		- The piece of wood reflects less amount of the light.
3. Repeat the previous step using the other materials.		

Conclusions :

1. Shiny and smooth materials reflect large amount of the light that falls on them, such as the mirror and the piece of metal.
2. Rough materials reflect small amount of the light that falls on them, such as the piece of wood, the piece of plastic, the piece of cloth and paper.

Check your understanding

▸ **Put (✓) or (✗) :**

1. Shiny objects reflect light better than rough objects. ( )
2. Wood reflects more light than a mirror does. ( )

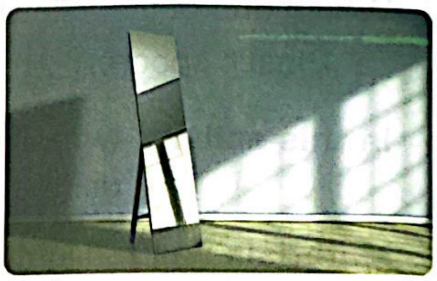
interact	يتفاعل	direct	توجيه	materials	مواد
shiny	لامع	smooth	ناعم	rough	خشن

Activity 5 Light Strikes Matter

▶ **In this activity, we will study what happens to light when it hits different types of matter.**

Light strikes matter

Light is a form of energy that travels in straight lines in the form of light waves.



Light reflection

▶ **When light hits an object :**

- Some of the light energy is absorbed by the object's surface.
- Some of the light energy reflects (bounces) off the object's surface.
- Some of the light energy may go through the object.

So, according to the previous explanation, objects can be classified into two groups which are :

Opaque objects	Transparent objects
- They are objects that don't allow light to pass through.  Opaque object - Things can't be seen through them.	- They are objects that allow light to pass through.  Transparent object - Things can be seen through them.
Examples : rocks, wood, metals and the human body.	Examples : air, water, glass windows and lenses.

Why do you see your body shadow ?

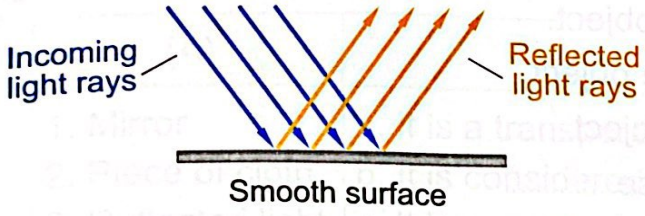
Your body is an opaque object that forms shadow, because the light that hits your body either bounces off or is absorbed but no light passes through your body.

matter	مادة	shadow	ظل	opaque	معتم	straight	مستقيم
absorb	يمتص	form	صورة	hit / strike	يصدم	transparent	شفاف

▸ **The direction of the reflected light rays depends on the smoothness of the surface, where :**

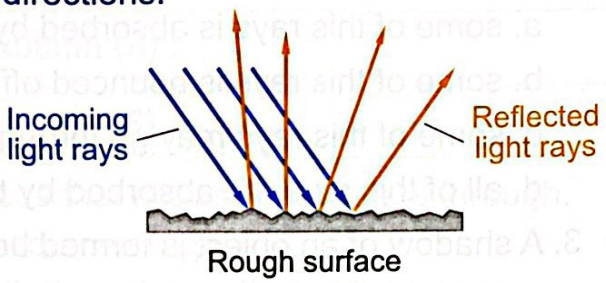
Smooth Surface

- If the surface is **smooth** (such as a mirror), the light rays will reflect in one direction with the same angle at which they strike (hit) the object originally.



Rough Surface

- If the surface is **rough** (such as a painted surface), the reflected light rays will scatter or diffuse in different directions.



▸ **How does light striking matter make it possible for humans and animals to see ?**

When light rays strike an object, light reflects (bounces) off this object.

The reflected light travels in a straight line into the eyes.

Special nerves in the eyes send messages to the brain.

The brain interprets the messages as an image of this object.

Check your understanding

▸ **Write the scientific term :**

1. Objects that allow light to pass through. (.....)
2. Objects that don't allow light to pass through. (.....)

In the Assessment Book :
Try to answer :
Self-Assessment (11)

incoming الوارد | originally فى الأصل | scatter / diffuse تفرق / تبعثر

Exercises on Lesson 2

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. Light travels in ..... lines in the form of waves.
   a. curved b. zigzag c. straight d. circular
2. When light rays hit an object, all the following sentences are correct, except ..... *(Cairo 2022)*
   a. some of this rays is absorbed by the object.
   b. some of this rays is bounced off the object.
   c. some of this rays may go through the object.
   d. all of this rays are absorbed by the object.
3. A shadow of an object is formed because .....
   a. light can pass through the object.
   b. light cannot pass through the object.
   c. this object is made of glass.
   d. this object is transparent.
4. Opaque material .....
   a. allows light to pass through.
   b. absorbs some of light that falls on it only.
   c. reflects some of light that falls on it only.
   d. absorbs some of light that falls on it and reflects the other.
5. All of the following are transparent objects, except ..... *(Cairo 2022)*
   a. glass. b. water. c. paper. d. air.
6. ..... allows most of light to pass through, while ..... don't.
   a. Air – glass b. Glass – air c. Wood – glass d. Glass – wood
7. Mirror causes falling light rays to .....
   a. pass through it.
   b. reflect at the same angle they strick the mirror.
   c. reflect in different directions.
   d. diffuse like that of rough surfaces.
8. Our eyes, ...
   a. can see through both opaque and transparent objects.
   b. cannot see through both opaque and transparent objects.
   c. can see through opaque objects, but not through transparent objects.
   d. can see through transparent objects, but not through opaque objects.

9. If there are two sheets, one is made of wood and the other is made of glass, ...
   a. you can see the glass sheet through the wood sheet.
   b. you cannot see the wood sheet through the glass sheet.
   c. you can see the wood sheet through the glass sheet.
   d. light can pass through both sheets.
10. Light rays can pass through lenses, so they are made up of .....
    a. wood. b. paper. c. glass. d. metal.

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Mirror	a. It is a transparent piece that allows light to pass through.
2. Piece of cloth	b. It is considered as a source of light.
3. Reflected light	c. It is a rough surface that scatters reflected light rays.
4. Lenses	d. It is the light that bounces off a reflecting surface.
	e. It is a smooth and shiny surface that reflects most of falling light.

1. ..... 2. ..... 3. ..... 4. .....

3 Put (✓) or (✗) :

1. Transparent objects include mirrors and lenses. ( )
2. Rough objects tend to reflect light better than smooth objects. ( )
3. Both wooden piece and paper reflect incoming light rays at the same angle at which they struck them. ( )
4. Mirror reflects most of incoming light rays that fall on it. ( )
5. The light reflection depends on smoothness of the object's surface. ( )

4 Write the scientific term of each of the following :

1. Materials that allow light to pass through. *(Cairo 2022 / 2023)* (.....)
2. Materials that we cannot see through it. (.....)
3. A type of surfaces that reflects light in different directions. (.....)

5 Correct the underlined words :

1. We see the objects as a result of the absorption of light rays into our eyes. (.....)
2. Opaque materials include water, glass, air and lenses. (.....)
3. Rough objects reflect light rays in one direction at the same angle at which they struck the object. (.....)

6 Complete the following sentences :

1. Light travels in ..... lines. *(Dakahlia 2022)*
2. Light travels in the form of .....
3. Objects that light can't pass through are called ....., while objects that allow light to pass through are called .....
4. A tree forms a shadow as it is an ..... object that doesn't allow ..... to pass through.
5. Cloth and paper are considered ..... surfaces that scatter or diffuse ..... energy.
6. Human body, wood and ..... are considered ..... materials which ..... light to pass through.
7. Rough materials reflect light ..... than smooth materials.
8. Things can be seen through ..... objects such as ..... and .....

7 Give reasons for :

1. Shadow of an opaque body is formed when light falls on it.

.....

.....

2. You can see an object placed behined a glass cup.

.....

.....

3. A mirror can reflect light better than a painted surface. *(Giza 2023)*

.....

.....

8 What happens if ... ?

1. You place a wood sheet between a light source and a wall.

.....

.....

2. Light falls on a transparent body such as a glass window.

.....

.....

3. Light falls on a rough surface.

.....

.....

9 **Arrange the following statements to show the correct sequence of how humans see different objects :**

(.....) Special nerves in the eyes send messages to the brain.

(.....) The reflected light rays travels in a straight line into the eyes.

(.....) The brain interprets the messages as an image.

(.....) Light rays reflect off objects around us.

10 **Look at the following figures, then answer the questions below :** *(Giza 2022)*

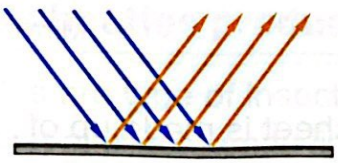


Figure (a)

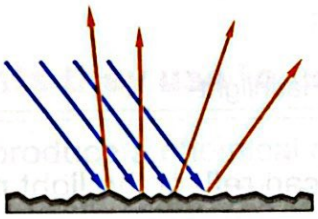


Figure (b)

1. Complete :

a. The surface in figure (a) is .....

- Because .....

b. The surface in figure (b) is .....

- Because .....

c. In the previous two figures, the falling and reflected rays show that light travels in ..... lines.

2. Choose :

The surface in figure (a) may be .....

a. plastic. b. wood. c. mirror. d. cloth.

11 **Classify the following materials into smooth materials and rough materials :**

" Cloth – Mirror – Wood – Metal – Paper "

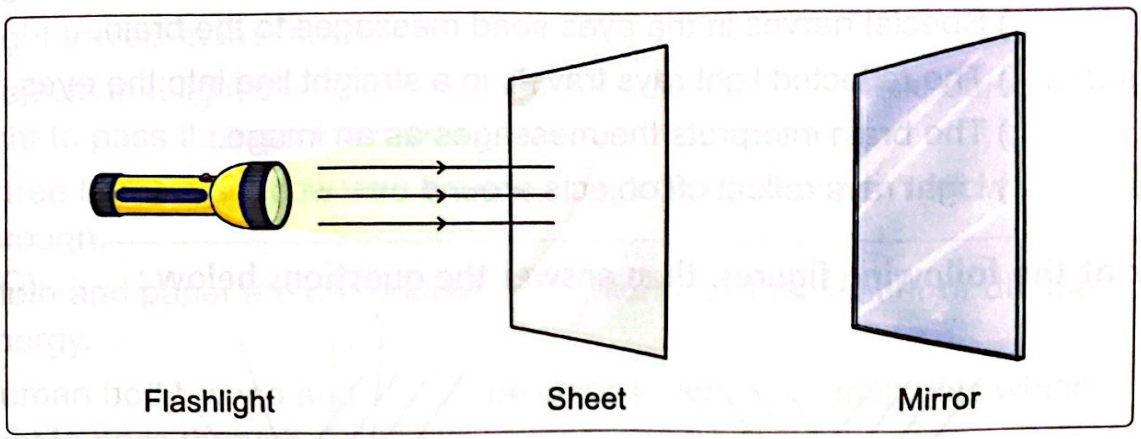
Smooth materials	Rough materials
.....	.....
.....	.....

12 **Classify the following materials into opaque objects and transparent objects :**

" Wood – Air – Water – Metal – Lenses "

Opaque objects	Transparent objects
.....	.....

13 Study the following figure that shows a sheet placed between a flashlight and a mirror, then choose the correct answer :



1. The mirror can reflect the light rays, if the sheet is made up of .....
(wood – glass)

2. If we replaced the sheet with another mirror, it will ..... the light rays.
(pass – reflect)

LESSON THREE

Activity 6 Firefly Light Show

▸ **Look at the opposite photo, then put (✓) or (✗) :**

1. The firefly beetle is considered as a type of insect. ( )
2. The firefly beetle can produce light. ( )

Firefly beetle

How do fireflies beetles produce the lights they use to communicate ?

- Fireflies beetles are type of insects that can produce a chemical reaction inside their bodies that allows them to light up and communicate with other fireflies.

▸ **How do fireflies use their senses to communicate ?**

1. Fireflies use their wings to form different flash patterns to :
   - Warn off other firefly beetles from predators.
   - Attract a mate to reproduce.
2. They flash at regular periods of time, but if there is another group of fireflies flashing nearby, they will change their own flash pattern to match the flash pattern of the other group to communicate.

Note

Humans use lights to communicate with each other to transfer information such as using traffic lights.

Check your understanding

▸ **Choose the correct answer :**

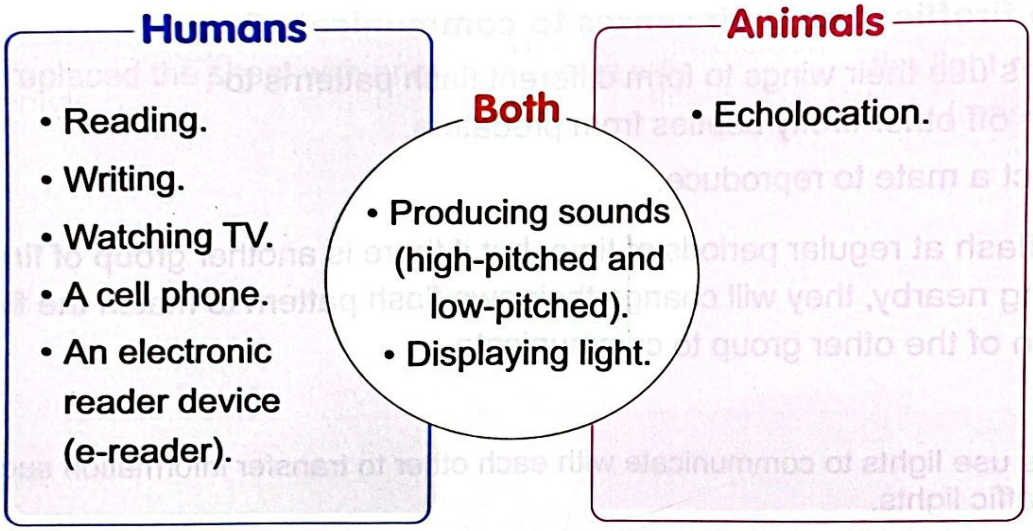
1. The chemical reaction inside firefly beetles allow them to .....
   a. reflect the sunlight. b. reflect the moon light.
   c. produce their own light. d. produce their own sound.
2. Firefly beetles use different flash patterns for .....
   a. warning off from predators only.
   b. attracting mates only.
   c. warning off from predators and attracting mates.
   d. warning off from mates and attracting predators.

chemical reaction	تفاعل كيميائى	forest	غابة	traffic lights	إشارات المرور الضوئية
regular	منتظم	pattern	نمط / أسلوب		

Activity 7 What Do You Already Know About Communication and Information Transfer ?

- There are some similarities and differences between types of communication and transferring information in humans and animals.

▸ **The following figure shows some different types of communication in humans, animals and both :**



Check your understanding

▸ **Choose the correct answer :**

1. ..... is considered as a type of communication that is used by humans only.
(Echolocation – A cell phone – Displaying light)
2. ..... is considered as a type of communication that is used by animals only.
(Writing – Echolocation – High-pitched sound)

In the Assessment Book :
Try to answer :
Self-Assessment (12)

Exercises on Lesson 3

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. A firefly is not a bird, but it is a type of .....
   a. amphibians. b. lizards. c. beetles. d. reptiles.
2. Which of the following is not a reason for fireflies to produce a flash light ? .....
   a. To attract a mate. b. For communication.
   c. To warn off from predators. d. To hear in the dark.
3. Changing the pattern of lighting up in a firefly is an example of ..... adaptation(s).
   a. structural and behavioral b. physical and behavioral
   c. only structural d. only behavioral
4. People can use the following ways to communicate, except .....
   a. reading. b. writing. c. speaking. d. flying.
5. The ability to communicate through language and speech separates ..... from animals.
   a. humans b. animals c. plants d. non living things
6. Reading and writing are common types of communication in ..... world.
   (Giza 2022 / Cairo 2023)
   a. humans b. animals c. birds d. plants
7. Displaying light is a type of communication that is found in both .....
   a. plants and animals. b. plants and humans.
   c. animals and humans. d. plants and non living things.

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Watching TV	a. is a type of communication in plants only.
2. Echolocation	b. is a type of communication in animals only.
3. Displaying light	c. is a type of communication in humans only.
	d. is a type of communication in both animals and humans.

1. ..... 2. ..... 3. .....

3 Put (✓) or (✗) :

1. Fireflies produce flash lights to warn off from predators. ( )
2. Fireflies are wingless beetles. ( )

3. Speaking is the only way to communicate with people. *(Giza 2023)* ( )
4. Echolocation is a type of communication between humans. ( )
5. Fireflies produce a chemical reaction inside their bodies that allows them to light up. ( )
6. A cell phone is a device that is used in communication between humans. ( )

4 Complete the following sentences :

1. Fireflies use the sense of ..... to communicate with each other. *(Cairo 2023)*
2. Fireflies produce flash patterns to attract ..... to reproduce.
3. Fireflies communicate with each other by producing a ..... inside their bodies that makes them light up.
4. A group of fireflies can change their own ..... to match the flash pattern of another group to communicate.
5. Watching TV is a type of communication that use the senses of ..... and .....
6. Among the types of communication that are used by humans only are ..... and .....
7. The types of communication that are used by both animals and humans are ..... and .....

5 Give reasons for :

1. Humans receive and send information through speaking, writing and reading.
.....
2. Fireflies use different patterns of flash lights to communicate with each other.
.....
3. Fireflies produce a chemical reaction inside their bodies.
.....

6 What happens if ... ?

A firefly wants to attract a mate to reproduce. *(Cairo 2023)*
.....

7 Put (✓) in front of the way of communication used in each of the following items :

Items	Light	Sound	Both light and sound
1. Car lamps.			
2. Television.			
3. Traffic lights.			
4. Radio.			

LESSON FOUR

Activity 8 Transferring Information

▸ **Put (✓) or (✗) :**

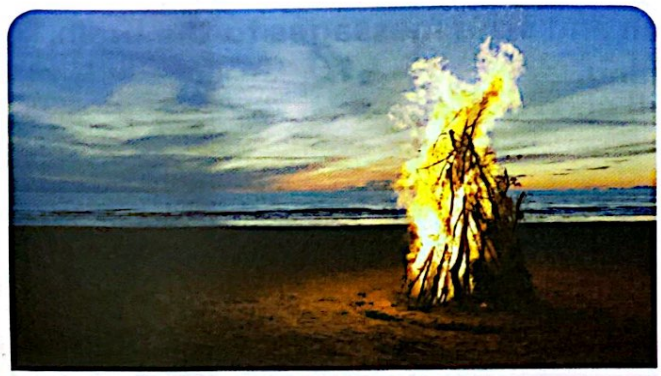
1. Fireflies communicate with each other through sounds. ( )
2. Humans communicate with each other through language. ( )

- Sense organs collect information about the world around us then send signals to the brain through nerves for processing and understanding.
- Human senses are used to gather information from the environment and communicate with others, where :
  1. Eyes detect light energy.
  2. Ears detect sound energy.

▸ **Examples of information that the eyes receive :**

1. Seeing the red traffic light means that you must stop.

2. People use a rescue flare to get help.



3. People use signal fires to communicate over distances of many kilometers.

4. Many hikers (travelers) use mirrors to attract the attention of rescue helicopters.

Codes and transferring information :

• Humans use codes to transmit information.

Code :

It is a pattern that has meaning.

rescue flare شعلة انقاذ | hikers / travelers رحالة / مسافرين | attention انتباه

Examples :

- **Thumbs-up or thumbs-down :** can express simple meanings like good and bad.
- **Traffic lights :** can express simple meaning like stop and go.

- **Expressions on faces :** are codes that can help people predict our feelings such as happy, sad, angry ... etc.

- **Language :** is a code in the form of sounds, where different languages are different codes that are used to transfer information.

- **Writing :** is a code that uses symbols in a pattern to give a specific meaning according to the arrangement of letters in a word.

- **Music or Sounds :** are different sound tones produced from humans or musical instruments can be used in communication.

- **Lighthouse :** sends codes in the form of flashes of light that tell sailors where they are.

When sense organs receive this information and send messages to the brain, the brain decodes and interprets the meaning.

Check your understanding

▶ **Put (✓) or (✗) :**

1. Ears and eyes send signals to the brain through nerves for processing and understanding. ( )
2. The code is a pattern that has meaning. ( )

Review on Concept (1.3)

To review this concept look at the **Assessment Book** "**Part 2 :** Final Revision".

In the Assessment Book :
Try to answer :
- Self-Assessment (13)
- Model Exam on Theme (1)

thumb	الأبهام	feelings	مشاعر	interpret	يفسر
express	يعبر	instruments	الآلات / الأدوات	sailors	البحارة
expressions	التعبيرات	lighthouse	فنار / منارة		
predict	يتنبأ / يتوقع	decode	يحل شفرة		

Exercises on Lesson 4

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. All of the following are forms of codes, except ..... *(Ismailia 2022)*
   a. thumb up and down hands. b. faces expressions.
   c. writing. d. swimming.
2. When your eyes see a red traffic light, this means that you have to .....
   a. increase your speed. b. cross the street.
   c. keep your speed as it is. d. stop at once.
3. People use a rescue flare to communicate with each other depending on the sense of .....
   a. hearing. b. sight. c. smell. d. touch.
4. Sense organs collect information and send signals to ..... for processing and understanding. *(Port Said 2022)*
   a. hands b. legs c. brain d. stomach
5. All the following signals are information that the eyes receive, except .....
   a. green traffic light. b. fire alarm.
   c. signal fires. d. rescue flare.

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Thumb-up 2. Thumb-down	a. is a code that means that you are in a danger. b. is a code that means that you say "Yes". c. is a code that means that you say "No".

1. ..... 2. .....

3 Put (✓) or (✗) :

1. Animals communicate with each other by using different senses. ( )
2. Sense organs can decode the information that is sent by the brain. ( )
3. Expressions on faces are codes that can help people predict our feelings. ( )
4. Different languages have similar codes. ( )
5. People use signal fires to communicate over distances of many kilometers. ( )

4 Write the scientific term of each of the following :

1. Sense organ that can detect sound energy. (.....)
2. Sense organ that can detect light energy. *(Giza 2022)* (.....)
3. It sends flash codes that tell sailors where they are. (.....)

5 Complete the following sentences :

1. Humans can communicate with each other where ears of human detect ..... energy and eyes of human detect ..... energy.
2. Fireflies use ..... energy in their communication.
3. Music is codes that use the sense of ..... to communicate.
4. Writing is a way of coding that uses the sense of ..... to communicate.

6 Give reasons for :

1. The symbols that are used in writing have a specific pattern.

.....

2. People use face expressions during talking with each other.

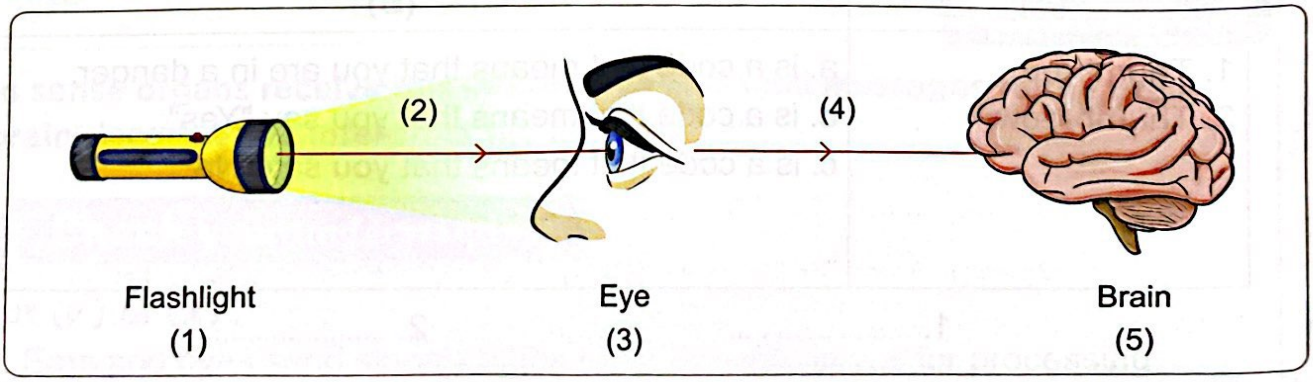
.....

7 What happens if ... ?

The traffic light becomes red while you are going to cross the road.

.....

8 Study the following figure , then put (✓) or (✗) : :



1. Number (5) represents the sense organ of light. ( )
2. Number (1) represents a source of light. ( )
3. Number (4) represents a special nerve through which the eye sends information to the brain for processing it. ( )
4. Number (2) represents a light ray that travels in straight line to enter the eye. ( )
5. Number (3) and (5) working together to collect and process different sounds. ( )

Model Exam 1 on Concept (1.3)

Total mark: 15

1 (A) Choose the correct answer : *(5 marks)*

1. ..... can communicate by displaying light.
   a. All animals
   b. All plants
   c. All plants and animals
   d. Humans and some animals
2. Each of human and fishing cat, ...
   a. has a mirror-like membrane in their eyes.
   b. has an excellent night vision.
   c. has two eyes adapted for vision.
   d. becomes more active at night.
3. Which of the following communications depends on the sense of sight only ? .....
   a. Watching TV.
   b. Flashing lights of fireflies.
   c. Echolocation.
   d. Using the cell phone.
4. Painted surface ..... the incoming light rays.
   a. absorbs only
   b. reflects only
   c. absorbs and reflects
   d. allows to pass

(B) Give a reason for the following :

You can see an object placed behined a glass cup.

.....

.....

2 (A) Put (✓) or (✗) : *(5 marks)*

1. Transparent objects don't allow light to pass through them. ( )
2. Human has huge eyes like fishing cat to gather and reflect any light available. ( )
3. Nocturnal animals have bigger eyes than humans. ( )
4. Human can see in dim light as well as in bright light if his eyes contain a mirror-like membrane. ( )

(B) What happens if ... ?

Light falls on a rough surface.

.....

3 (A) Complete the following sentences : *(5 marks)*

1. The ..... is the main control center in humans and animals bodies, while ..... are considered the organ of sight in their bodies.
2. Fishing cats depend on the sense of ..... in weak light levels, while in complete darkness they depend on the senses of ..... and .....
3. In the eyes of ..... animals, there is a mirror-like membrane that ..... light.
4. Paper and a piece of cloth are considered ..... surfaces that diffuse or scatter ..... energy.

(B) Cross out the odd word :

1. Fire – Candle – The moon. (.....)
2. Flashlight – The moon – Mirror. (.....)

Model Exam 2 on Concept (1.3)

Total mark: 15

1 (A) Choose the correct answer : *(5 marks)*

1. The mirror-like membrane of the fishing cat is present .....
   a. inside the lungs. b. at the back of the eye.
   c. inside the stomach. d. at the back of the brain.
2. Light travels in ..... lines in the form of waves.
   a. circular b. curved c. zigzag d. straight
3. Reading and writing are common types of communication in ..... world.
   a. plants b. humans c. animals d. insects
4. Sense organs collect information and send signals to ..... for processing and understanding,
   a. legs b. stomach c. brain d. hands

(B) Give a reason for the following :

The fishing cat's eyes seem to glow in the dark.

.....

2 (A) Complete the following sentences : *(5 marks)*

1. Human can see objects which give off their own light or objects which ..... light.
2. Rough materials reflect light ..... than smooth materials.
3. A group of firefly beetles can change their own ..... to match the flash pattern of another group to communicate.
4. Ears of humans detect ..... energy, while their eyes detect ..... energy.

(B) What happens if ... ?

The mirror-like membrane in the fishing cat's eyes is not present.

.....

3 (A) Put (✓) or (✗) : *(5 marks)*

1. Cats have excellent night vision, while humans are not. ( )
2. Mirror reflects most of incoming light rays that fall on it. ( )
3. Different languages have similar codes. ( )
4. A cell phone is a device that is used in communication between animals. ( )

(B) Write the scientific term of each of the following :

1. Materials that allow light to pass through. (.....)
2. The sense organ of light (.....)

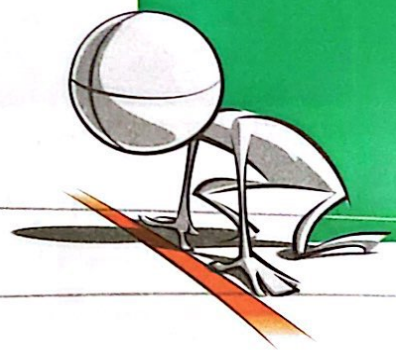
THEME TWO :
MATTER AND ENERGY

UNIT 2

MOTION

Get Started

What I Already Know



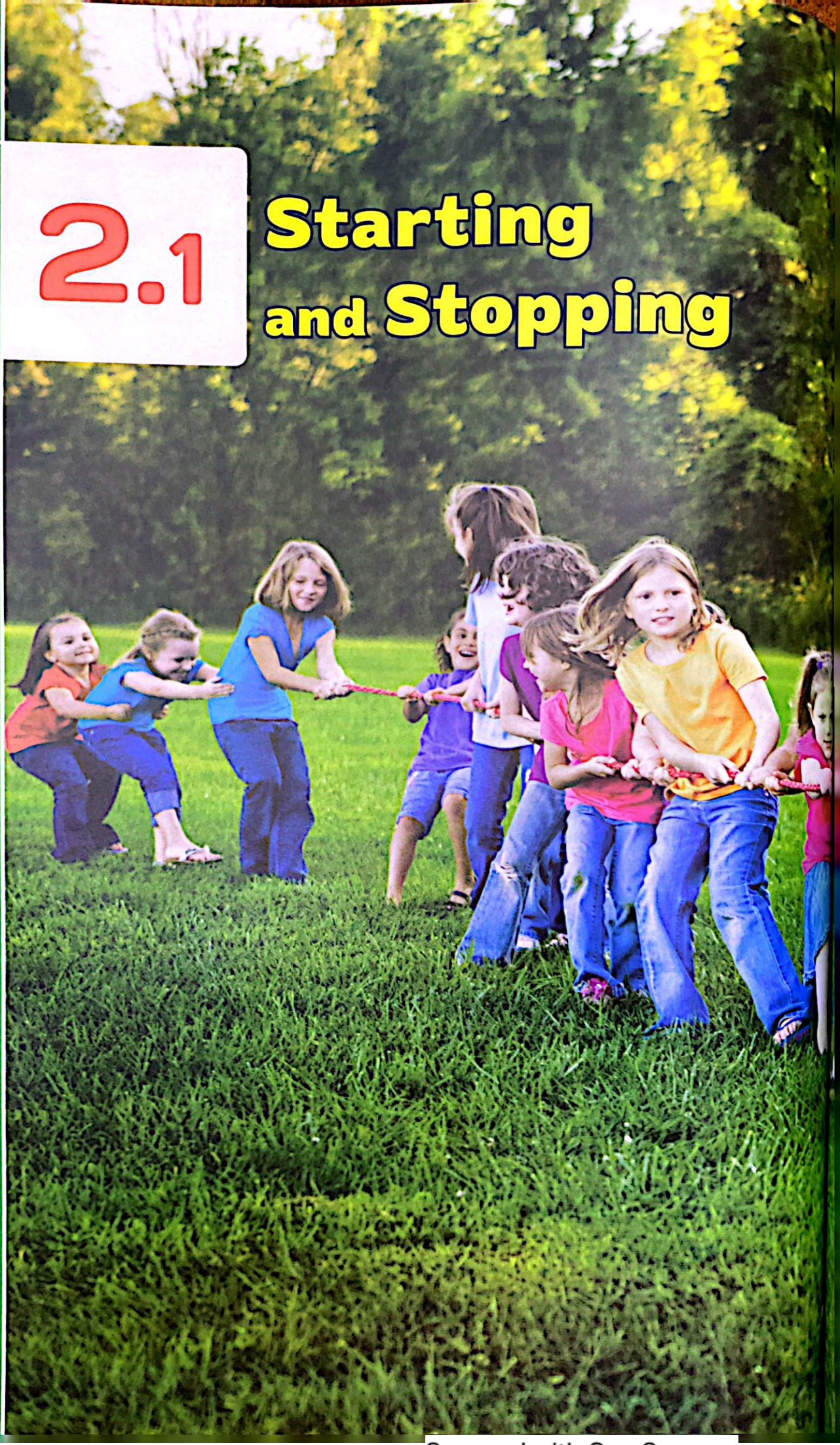
- **All objects need energy to start or to stop motion.**
- **The opposite image shows a person in a wheelchair, where :**
  - This person needs a small amount of force and energy to push the wheels of the chair to move down the ramp.
  - But, if this person needs to move up the ramp, so this person needs a larger amount of force and energy to push the wheels.

- **In this unit, you are going to study :**
  - How energy and motion are related.
  - How energy changes when a force affects an object.
  - The relationship between energy and work.
  - How to observe and calculate the speed of a moving object.
  - What happens when objects collide or crash together ?

- **Unit project : Vehicle safety :**
  - Cars have a lot of safety features to keep the driver and passengers safe during crashes such as seatbelts and airbags.
  - At the end of this unit, you are going to make a research project about one of the safety features in cars and create a plan to improve this safety features.

Concept

2.1 Starting and Stopping



Learning outcomes

By the end of this concept, your child will be able to :

- Explain and model what causes objects to change motion.
- Analyze data to explain different causes of changes in an object's motion.
- Cite evidence to show how speed is related to energy for an object.
- Model the cause and effect relationship between the force acting on an object and the object's motion.

Key vocabulary

- Energy
- Force
- Friction
- Gravity
- Motion
- Work

Notes For Parents On Concept [2.1]

Lessons	Activities	What you should do with your child
1	Activity 1	Discuss with your child some examples that need pushing or pulling forces.
	Activity 2	Explain to your child the meaning of the "jet engine" and also help him/her to read more about the "the Shockwave truck".
	Activity 3	Discuss with your child how the air provides force to move some objects.
2	Activity 4	Explain to your child the effect of balanced forces and unbalanced forces in our daily life.
	Activity 5	Discuss with your child the meaning of "gravity" and its effect on all objects on the Earth's surface.
	Activity 6	Explain to your child the meaning of "force" and its effect in our daily life.
3	Activity 7	Explain to your child the meaning of "friction force" and also let him/her mention some examples of friction force.
	Activity 8	Discuss with your child the relation between the amount of force acts on an object and the distance covered by this object.
4	Activity 9	Discuss with your child the relation between energy, work and force.
	Activity 10	Help your child to think like a scientist by answering a question about one of the main points of this concept, then write his/her claim, evidence and scientific explanation.

LESSON ONE

Activity 1 Can You Explain ?

Did you think about how each of the objects above start to move ?

- The objects above require a force to stop or move.
  This force could be a pushing force or a pulling force.
- To move or to stop an object, the forces acting on this object must change.
- We need energy to apply these forces to the objects, where :
  - The person in picture 1 needs energy to push the car.
  - The person in picture 2 needs energy to pull the suitcase.
  - The football player in picture 3 needs energy to push the ball, while the goalkeeper needs energy to push against the ball to stop it.

In this concept, we will study :

- How forces act on different objects to move or stop them.
- The meaning of force.
- The relationship between energy, work and force.

force	قوة	pushing force	قوة الدفع	pulling force	قوة السحب
goalkeeper	حارس مرمى	against	ضد/عكس	suitcase	حقيبة سفر
acting on	يؤثر على	require	تتطلب	energy	طاقة

Activity 2 Truck Versus Airplane

▸ **Look at the following pictures, then put (✓) or (X) :**

An airplane can move faster than a truck. ( )

Truck

Airplane

Truck versus jet airplane :

In the pictures above, the engines on a jet airplane are much more powerful than the engine in a truck.

So, jet airplanes fly much faster than moving trucks.

The Shockwave truck :

- The truck in the opposite picture is called "the Shockwave"
- The Shockwave truck contains three jet engines.

The Shockwave truck

How does the Shockwave move ?

- The three jet engines make the Shockwave truck reach speeds more than 500 kilometers per hour.
- The Shockwave is about five times faster than the normal trucks.

How does the Shockwave stop ?

- To stop the Shockwave, engineers install three parachutes in it, that the driver opens them to help slow down the Shockwave quickly.
- The idea of parachutes is used in rocket designs.

Check your understanding

▸ **Complete the following sentences using the words below :**

(faster than – slower than)

1. The speed of a normal truck is ..... that of a jet airplane.
2. The speed of the Shockwave truck is ..... that of a normal truck.

truck	شاحنة	engineer	مهندس	engine	محرك	rocket	صاروخ
jet airplane	طائرة نفاثة	versus	عكس	install	مثبت		

Activity 3 Making Things Move

All objects around us cannot move without push and pull forces, where :

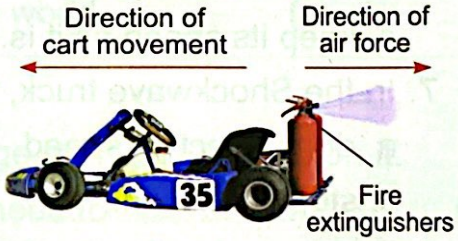
A ball lying on the ground does not move until someone pushes it with his foot to make the ball roll.

A closed drawer does not open until someone pulls the handle with his hand to open the drawer.

Air force :

- Air can provide enough force to move some objects such as : The wind blowing that can move the leaves of a tree.
- **Let's see how engineers prove that the force of air can move some objects like "a cart".**

- Some engineers fix fire extinguishers onto a cart.
- When they release air from the fire extinguishers, the air moves backward that makes the cart begins to move forward.
- By increasing the number of fire extinguishers, the speed of the cart increases and the distance that it moves increases too and vice versa.



A cart with fire extinguishers

Check your understanding

Put (✓) or (✗) :

1. Objects can move due to the effect of push or pull forces. ( )
2. Air has a force that can move some objects. ( )

In the Assessment Book :
Try to answer :
Self-Assessment (14)

roll	يدحرج	provide	يمد	fire extinguisher	طفاية حريق	release	إطلاق
handle	مقبض	wind blowing	هبوب الرياح	vice versa	العكس صحيح	distance	مسافة
leaves	أوراق الأشجار	fix	يثبت	cart	عربة صغيرة	enough	كافى

Exercises on Lesson 1

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. Push or pull actions are considered as types of ..... *(Giza 2023 / Alexandria 2022)*
   a. force. b. device. c. energy. d. adaptation.
2. When you kick a ball, it moves due to the effect of .....
   a. pulling force only. b. pushing force only.
   c. pushing and pulling forces. d. sound energy only.
3. When you move something away from you, this represents .....
   a. pushing force. b. light energy. c. pulling force. d. sound energy.
4. When you move something toward you, this represents .....
   a. pushing force. b. light energy. c. pulling force. d. sound energy.

(Cairo 2023 / Cairo 2022)

5. The speed of a normal truck is more than that of .....
   a. a jet airplane only. b. a jet airplane and a rocket.
   c. a rocket and a bicycle. d. a bicycle only.
6. Parachutes are used in the Shockwave truck to .....
   a. increase its speed. b. decrease its speed.
   c. keep its speed as it is. d. change its direction.
7. In the Shockwave truck, the three jet engines, ...
   a. don't affect its speed. b. decrease its speed.
   c. stop its motion. d. increase its speed.
8. By increasing the number of fire extinguishers fixed to a cart, its speed .....
   a. increases. b. decreases.
   c. doesn't change. d. becomes zero.
9. All the following motions occur by the effect of pulling force, except .....
   a. kicking a ball. b. opening a closed drawer. *(Cairo 2022)*
   c. wearing your socks. d. lifting up a bag from the ground.
10. The ..... of the air that comes out of fire extinguishers causes the movement of a cart forward.
    a. pulling force b. light energy c. pushing force d. sound energy

2 Put (✓) or (✗) :

1. To open or close a door, we have to push or pull it. ( )
2. Putting on a pair of socks needs a pushing force. ( )

3. You need energy to push a car forward or backward. ( )
4. A car can move faster than a bicycle. ( )
5. A normal truck can move faster than a jet airplane. ( )
6. The three jet engines in the Shockwave truck allow it to fly. ( )
7. A normal truck is slower than the Shockwave truck. ( )
8. Parachutes are used to slow down the speed of the Shockwave truck quickly. ( )
9. When the air is released backward from the fire extinguishers fixed to a cart, the cart moves backward. ( )
10. By decreasing the number of fire extinguishers fixed to a cart, the speed of the cart increases. ( )
11. Using a remote control of a television needs a pushing force to act on its buttons. ( )
12. By increasing the speed of a moving cart, the distance that it moves will decrease. ( )

3 Write the scientific term of each of the following :

1. A force that you make to move an object toward you. (.....)
2. A force that you make to move an object away from you. *(Cairo 2023)* (.....)
3. One of the fastest and most powerful trucks in the world. (.....)

4 Complete the following sentences :

1. The car can move or stop depending on the change of ..... acting on it.
2. To move anything from one place to another, you need to ..... it or ..... it.
3. In the Shockwave truck, engineers put three ..... in it to increase its speed, and they installed three ..... to stop it.
4. The idea of stopping the Shockwave truck is the same idea of stopping a moving .....
5. Engineers use ..... to slow down the motion of the ..... truck and rockets.
6. The wind can move small things like ..... of a tree, so engineers use this idea in moving a cart by fixing ..... onto it.
7. If we put more than one fire extinguisher to a cart, so the ..... of this cart will increase.

5 Give reasons for :

1. The Shockwave truck is faster than the normal truck.
.....

2. Engineers use parachutes in the Shockwave truck designs.

.....

3. When you kick a ball laying on the ground, it moves.

.....

6 What happens if ... ?

1. You kick a stopped ball on the ground.

.....

2. Engineers placed jet engines inside a normal truck instead of its normal engine.

.....

3. The Shockwave driver opens the parachutes.

.....

7 Look at the following pictures, then complete the following sentences :

Picture (1) : Normal truck

Picture (2) : Jet airplane

1. The engine of picture (.....) is much powerful than the engine of picture (.....).
2. When the engines of picture (.....) are placed in the picture (.....) it will turn into the Shockwave truck.
3. The engines that are used in picture (.....) are the same engines that are used in the Shockwave truck.

8 Look at the opposite figure, then answer the following questions :

1. In the opposite figure what happens if we increase the number of fire extinguishers fixed to the cart.

.....

.....

2. **Put (✓) or (✗) :**
   1. The air released by fire extinguishers moves backward, so the cart moves forward. ( )
   2. When we decrease the number of fire extinguishers, the cart moves for a longer distance. ( )

LESSON TWO

Activity 4 What Do You Already Know About Starting and Stopping ?

▸ **Put (✓) or (✗) :**

A ball will not move if you push it with your foot. ( )

How do objects move ?

There are two forces that cause objects to move which are :

Pushing force	Pulling force
Example : A man pushes a wheelbarrow. 	Example : A child pulls a toy car. 

The relation between motion with balanced and unbalanced forces :

Balanced forces	Unbalanced forces
- If there are balanced forces act on an object, so this object will not move. Example : - In the tug-of-war game, if the two teams are pulling the rope with equal forces. - This means that, the forces that act on rope are balanced (equal) forces. - So, the rope will not move. 	- If there are unbalanced forces act on an object, so this object will move. Example : - In the tug-of-war game, if one team is pulling the rope with a greater force. - This means that, the forces that act on the rope are unbalanced (unequal) forces. - So, the rope will move toward the team with the greater force. 

wheelbarrow	عربة يدوية	unbalanced forces	قوى غير متوازنة	rope	حبل
balanced forces	قوى متوازنة	tug-of-war	شد الحبل	team	فريق

Check your understanding

▸ **Put (✓) or (✗) :**

1. If an object moves, it means that the forces acting on it are balanced. ( )
2. The unbalanced forces cause objects to move. ( )

▸ **Complete the sentence below each picture, using the words "pushing" or "pulling" :**

1. The player uses the ..... force to hit the ball.

2. The man uses the ..... force to move his suitcase.

3. Children use the ..... force in tug-of-war game.

4. The boy uses the ..... force to move his skating board.

hit يضرب skating board لوح التزلج

Activity 5 Objects in Motion

How do we know an object is moving ?

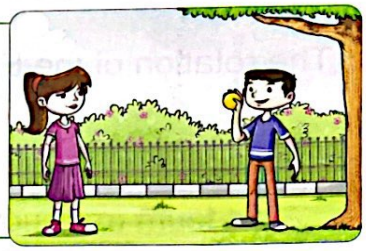
- An object is in motion if its position changes from one place to another, even if this change can't be seen.
- The change in position of an object is compared to something else that is not usually moving (fixed point).

Motion :

It is any change in the position of an object relative to a fixed starting point.

▸ Example of an object motion :

The boy holding a ball in starting position which is close to the tree.

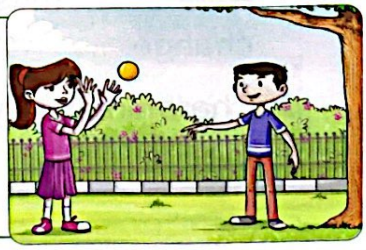


When he throws the ball, it will move by the pushing force through the air.

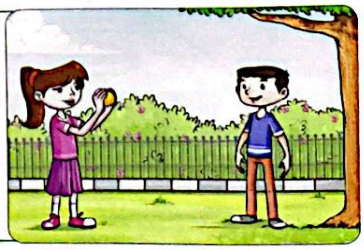
Then the ball will drop into the hand of the girl by the pulling force of gravity.

Gravity :

It is the force that pulls objects down toward the Earth.



- The ball will stop by the pushing force of the hand of the girl against the ball movement.
- The position of the ball changes, relative to the tree which is the fixed starting point.



motion	حركة	throw	يرمى	starting	بداية	toward	تجاه
relative to	نسبة إلى	drop	يسقط	position	مكان	fixed point	نقطة ثابتة
holding	إمساك	gravity	الجاذبية	close to	قريب من		

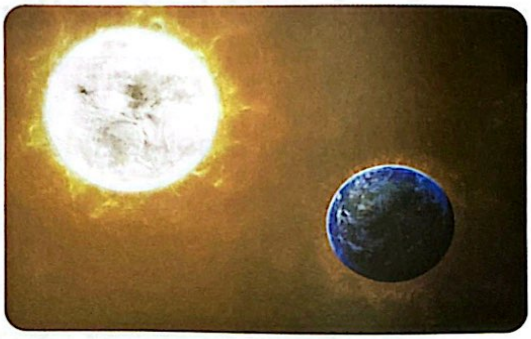
- **Some motion are easy to see, such as :**

A person walking down the street.

Leaves move by the wind blowing.

- **Some motion are hard to see, such as :**

The rotation of the Earth around the Sun.



Check your understanding

▸ **Complete the following sentences using the words below :**

(pull – position – force – motion)

1. A ..... must act on a ball to start motion, so the ..... of the ball will change.
2. There are two types of force which are a push force and a ..... force that cause the ..... of any object.

blowing تهب street شارع rotation دوران

Activity 6 Force

What makes objects move ?

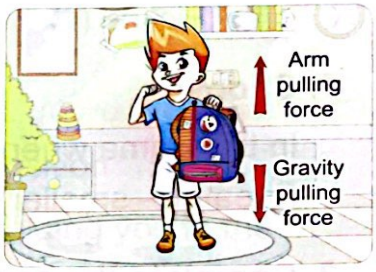
Any object needs a **force** to move and change its position.

Force :

It is a push or pull that is applied to an object causes it to change its position.

▸ What are the forces that affect the bag when you lift it ?

- The force of the gravity pulls your bag downward.
- The force of your arm pulls your bag upward.
- The pulling force of your arm is greater than the pulling force of the gravity (two unbalanced forces).
  So, the bag moves up toward the greater force.



Note

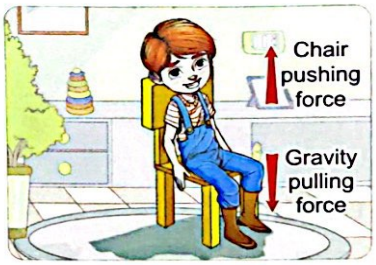
To move up any object from the ground, the pulling force of your arm must be greater than the pulling force of the gravity.

▸ Is there any force affects objects when they are not in motion ?

1. When you sit on a chair :

- The force of the gravity pulls you downward.
- The chair exerts force that pushes your body upward.
- The pulling force of the gravity is equal to the pushing force of the chair (two balanced forces).

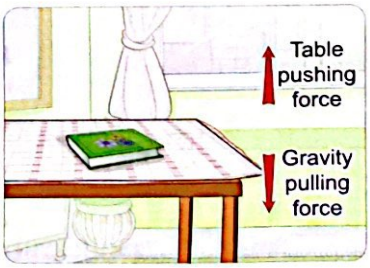
So, there is no motion due to the two balanced forces that hold you in the chair.



2. When a book is put on a table :

- The force of the gravity pulls the book downward.
- The table exerts force that pushes the book upward.
- The pulling force of the gravity is equal to the pushing force of the table (two balanced forces).

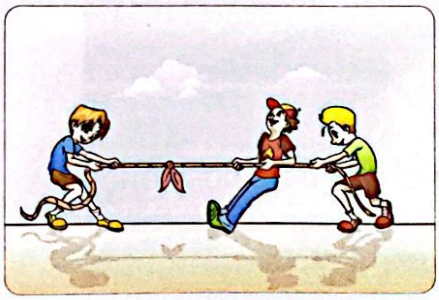
So, there is no motion due to the two balanced forces that affect the book.



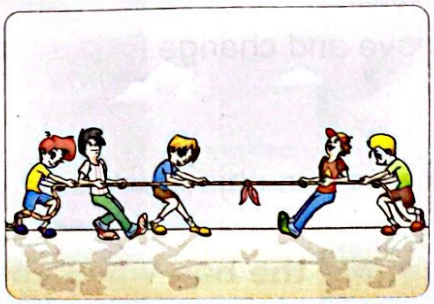
exert يبذل lifting يرفع downward لأسفل applied to تنطبق على upward لأعلى

Check your understanding

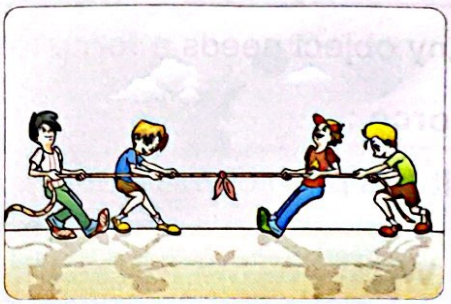
▶ **Look at the following pictures, then answer the questions below :**



Picture (1)



Picture (2)



Picture (3)

1. Choose :

In this game when the rope moves, it moves toward the team with ..... force (greater – smaller).

2. Complete the sentences by writing if the forces are "balanced" or "unbalanced" :

a. The forces in picture (1) are .....

b. The forces in picture (2) are .....

c. The forces in picture (3) are .....

In the Assessment Book :
Try to answer :
Self-Assessment (15)

Exercises on Lesson 2

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. All objects around us can move by the effect of .....
   a. pushing force only. b. pulling force only.
   c. pushing and pulling forces. d. sound and light energies.
2. A ball may move away from the foot of a football player by the effect of .....
   a. pushing force only. b. pulling force only.
   c. pushing and pulling forces. d. sound energy only.
3. When an object is in motion, this means that its ..... changes. *(Cairo 2023 / Cairo 2022)*
   a. color b. shape c. size d. position
4. When you sit on a chair, the force of gravity is ..... and holding you in the chair.
   a. pulling you upward. b. pulling you downward.
   c. pushing you upward. d. pushing you downward. *(Cairo 2022)*
5. What makes a ball in the air fall down to the ground ? .....
   a. Friction force. b. Gravity force.
   c. Sound energy. d. Light energy.
6. Which of the following will cause an object to move ? .....
   a. Balanced forces. b. Unbalanced forces.
   c. Sound energy. d. Light energy. *(Luxor 2022)*
7. In the tug-of-war game, two teams .....
   a. pull the rope in the same direction.
   b. push the rope in the same direction.
   c. pull the rope in opposite directions.
   d. push the rope in opposite directions.
8. In the tug-of-war game, when two teams are pulling a rope, and the rope does not move toward any team, this means that .....
   a. equal forces are being applied on the rope in the same direction.
   b. equal forces are being applied on the rope in opposite directions.
   c. unequal forces are being applied on the rope in the same direction.
   d. unequal forces are being applied on the rope in opposite directions.

9. Which of the following is an example of unbalanced forces ? .....
   a. Two children push a box with the same force in opposite directions.
   b. Two children play on a seesaw without its moving up or down.
   c. Two children play on a seesaw, that moves up and down.
   d. Two teams play the tug-of-war game while the rope doesn't move.

10. All of the following are examples of motion, except .....
   a. a running person.
   b. a ball travelling through the air.
   c. a flying bird.
   d. a sleeping dog.

11. Two equal forces act at the same time on a stopping object but in opposite directions. Which sentence describes the object's state ? .....
   a. The object stays in its place without moving.
   b. The object speed decreases.
   c. The object speed doesn't change.
   d. The object speed increases.

12. You can see the movement of the following objects, except the movement of ..... *(Giza 2023)*
   a. a flying airplane.
   b. a running horse.
   c. sea waves.
   d. the planet Earth.

13. Gravity is a force that ..... *(Kafr El-Sheikh 2022)*
   a. pushes objects down toward the Earth.
   b. pulls objects down toward the Earth.
   c. pushes objects toward the sky.
   d. pulls objects toward the sky.

2 Put (✓) or (✗) :

1. The stopping object can't move until a force acts on it. *(Cairo 2023 / Minia 2022)* ( )
2. The rotation of the Earth around the Sun is easy to be seen. ( )
3. Unbalanced forces keep an object in its place without moving. ( )
4. If the two teams in the tug-of-war game are pulling the rope with equal forces, the rope will move toward one of the two teams. ( )
5. Unbalanced forces cause a change in the object position. *(Minia 2023)* ( )
6. If one team in the tug-of-war game pulls the rope with a greater force, the rope will move toward the team with the smaller force. ( )

3 Write the scientific term of each of the following :

1. It is a push or pull that is applied to an object causes it to change its position. *(Cairo 2022)* (.....)

2. The force you can do to move an object away from you. (.....)
3. The force you can do to bring an object closer to you. (.....)
4. A change in the position of an object relative to a fixed starting point. (.....)
5. The force that pulls objects down toward the Earth. (.....)

4 Complete the following sentences :

1. As you are sitting down on a chair, there are two forces that act on your body which are the ..... force of gravity and the ..... force of the chair.
2. The toy placed on a table does not move due to the effect of the two balanced ..... acting on it.
3. In the tug-of-war game, the ..... force of the stronger team makes the rope moves toward this team.
4. When you throw a ball up in the air, it starts to fall down again toward the ground due to the effect of pulling force of .....
5. When you lift up an object from the ground, there are two forces act on it, which are the ..... force of your hand and ..... force of the gravity.
6. You can stop a moving basketball by the ..... force of your hand against the ball movement.
7. The train's position changes relative to the train station. This sentence describes the meaning of .....
8. A chair stands on the floor due to the pulling force of .....
9. If you throw a ball through the air, it is affected by the ..... force of your hand and the ..... force of the Earth's gravity.
10. We can say that the object is in motion when it changes its position relative to a ..... starting point.

5 Correct the underlined words :

1. Moving an object away from you represents a <u>pulling</u> force. (.....)
2. Moving an object toward you represents a <u>pushing</u> force. (.....)
3. The <u>balanced</u> forces cause the object to move. *(Giza 2023 / Gharbia 2022)* (.....)
4. When you jump up, the force of <u>friction</u> pulls you back to the ground. (.....)
5. Changing the position of an object relative to a fixed point is known as <u>force</u>. (.....)
6. The rope in the tug-of-war game may not move toward any team, if both teams <u>push</u> with the same force. (.....)

6 Give reasons for :

1. When two equal pushing forces act on an object in opposite directions, the object doesn't move.

.....

.....

2. If you let a pen out of your hand, it falls to the ground.

.....

.....

3. When your friend catches a ball that is thrown in the air, the motion of the ball is stopped.

.....

.....

7 What happens if ... ?

1. The pulling forces of the two teams are equal in the tug-of-war game.

.....

.....

2. You let your toy out of your hand.

.....

.....

8 Look at the following pictures, then choose if the forces are "Balanced" or "Unbalanced" :

1. A book on a table

(Balanced – Unbalanced)

2. A seesaw

(Balanced – Unbalanced)

9 **Write the type of force that is used in each of the following situations :**

1. .....

2. .....

3. .....

4. .....

10 **Look at the following picture, then choose the correct answer :**

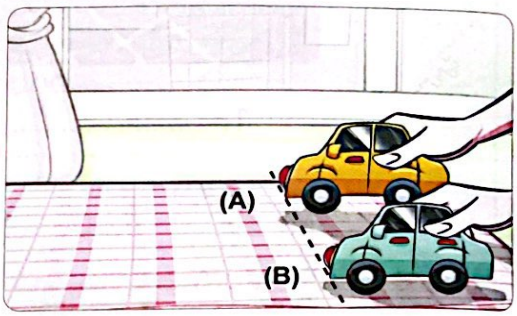
1. Among the forces that act on the basketball in this picture are .....
   a. pushing force of both gravity and the player's hand.
   b. pulling force of both gravity and the player's hand.
   c. pushing force of gravity and pulling force of the player's hand.
   d. pulling force of gravity and pushing force of the player's hand.

2. The basketball will fall down to the ground due to the ..... that acts on it.
   a. pushing force of gravity
   b. pulling force of gravity
   c. friction force of air
   d. friction force of ground

LESSON THREE

Activity 7 Stopping Motion

▶ **Look at the opposite figure, then choose the correct answer :**



- If we roll the two cars with two different forces, where car (B) is pushed with a force greater than car (A).

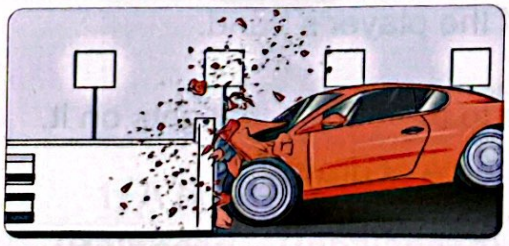
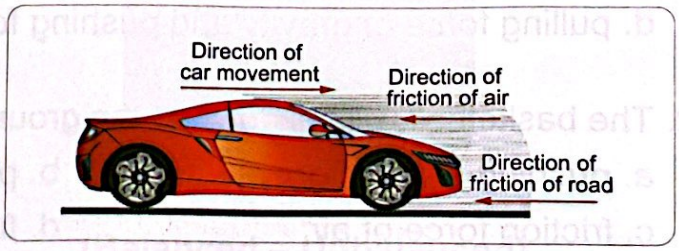
Which car travels a farther distance ? .....

[Car (A) – Car (B)]

How does an object in motion stop ?

A moving object only stops when a force of the same amount is applied to it in the opposite direction of its motion.

- **The force that stops a moving object may be :**

Easy to be observed	**Hard** to be observed
Example : • When a car crashes into a wall, it will stop. • Because the wall applied a force to the car with the same amount of the force that pushes the car toward the wall. 	Example : • When a car runs out of fuel on a flat road, its speed decreases gradually until it stops. • Because there is a friction force comes from : 1. Friction (rub) between the car tires and the road. 2. Friction between the air that flows over the car against its surface. 

observe	يلاحظ	farther	أبعد	friction	احتكاك	amount	كمية
crash	يصطدم	fuel	الوقود	tires	إطارات السيارة	opposite	عكس
run out	ينفد / ينتهى	gradually	تدريجيًا	rub	فرك	direction	اتجاه

Friction :

It is a force that is exerted when objects rub against each other.

Notes

1. Friction force always slows down or stops motion of moving objects.
2. The direction of friction force is always opposite to the direction of motion of a moving object.

Check your understanding

▸ **Complete the following sentences using the words below :**

(friction – opposes – unbalanced)

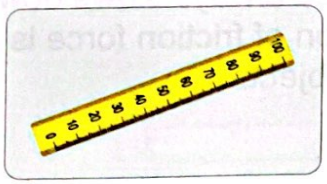
1. Any object moves from its place when the forces acting on it are .....
2. The force that slows down or stops motion is called .....
3. Friction is a force that ..... the motion direction.

Activity 8 Rolling Cars

- **You have learned about the causes of motion, in this activity you will explore the effect of applying different amounts of force to an object.**

Tools

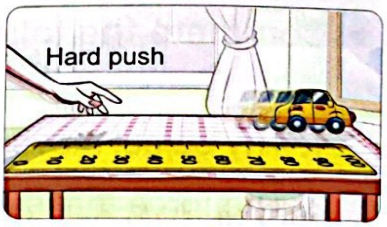
Toy car

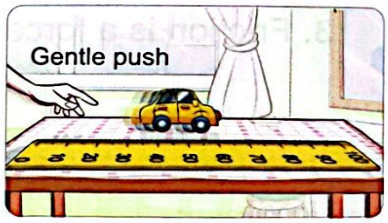


Measuring ruler

Steps

1. Push a toy car hard from a starting point, and record the distance the toy car rolls by using the measuring ruler.
2. Repeat the above step several times, and record the data in a table, then find the average distance.
3. Push a toy car very gently from the same starting point, and record the distance the toy car rolls.
4. Repeat step (3) several times, and record the data in another table, then find the average distance.





Observations

- The car moves a large distance when it is pushed hard as shown in the following table :

Hard push	
Trial	**Distance (cm)**
1	90 cm
2	75 cm
3	80 cm
4	95 cm

The average distance = $\frac{90 + 75 + 80 + 95}{4}$ **= 85 cm**

- The car moves a small distance when it is pushed gently as shown in the following table :

Gentle push	
Trial	**Distance (cm)**
1	14 cm
2	17 cm
3	20 cm
4	17 cm

The average distance = $\frac{14 + 17 + 20 + 17}{4}$ **= 17 cm**

explore	يكتشف	gently	بلطف / برقة	gentle push	دفعة خفيفة
several times	عدة مرات	trial	التجربة	data	بيانات
repeat	إعادة	hard push	دفعة قوية	record	يسجل
average distance	متوسط المسافة				

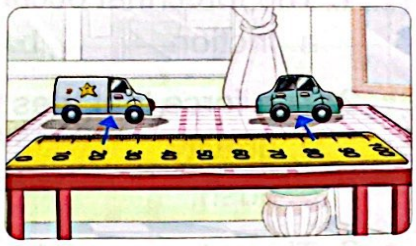
Conclusions

- Hard push causes object to travel a long distance.
- Gentle push causes object to travel a small distance.

Note

If the same force acts on a toy car and a toy truck :

- The car (the smaller object) will travel a farther distance.
- The truck (the bigger object) will travel a shorter distance.



Check your understanding

▸ **Put (✓) or (✗) :**

1. A toy car travels a very small distance when it is pushed hard. ( )
2. When we push a toy car and a toy truck with the same force, the toy car will move faster. ( )

In the Assessment Book :
Try to answer :
Self-Assessment (16)

Exercises on Lesson 3

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. The force that occurs when an object rubs against another object is called .....
   a. friction. b. gravity. c. push. d. pull. *(Minia 2022)*
2. The force that tries to stop an object moving on a surface is called .....
   a. gravity. b. friction.
   c. push. d. pull.
3. There is a ..... force between the car tires and the road that acts to decrease car's speed gradually. *(Cairo 2023 / Dakahlia 2022)*
   a. gravity b. pulling
   c. pushing d. friction
4. Which of the following sentences describes the friction force ? .....
   a. It pulls objects toward the ground.
   b. It pushes objects away from the ground.
   c. It slows down or stops objects in motion.
   d. It doesn't affect objects in motion.
5. When an apple falls from a tree down to the ground, it is affected by .....
   a. friction force of air only.
   b. gravity pulling force only.
   c. gravity pushing force only.
   d. friction of air and gravity pulling forces.
6. Tamer pushes a ball on a flat ground and it covers a distance of 30 cm. If he pushes it with more force, it may cover a distance equal to ..... cm.
   a. 5 b. 15 c. 30 d. 50

2 Put (✓) or (✗) :

1. When a car crashes into a wall, it will not stop. *(Alexandria 2023)* ( )
2. Sometimes it is easy to observe the force that stops an object. ( )
3. When a car runs out of fuel on a flat road, its speed increases gradually until it stops. *(Sharkia 2023)* ( )
4. Friction force always slows down or stops the motion of moving objects. ( )
5. The motion of an object on the ground is affected by a friction force. ( )
6. Hard push causes an object to travel for a longer distance. ( )
7. If the same force acts on two different objects so, the bigger object will travel for a longer distance. ( )
8. A football rolls on the ground to a distance then it stops. The force which stops the ball is the gravity force. ( )

3 Correct the underlined words :

1. Moving object stops when a force of the same amount is applied to it in the same direction of its motion. (.....)
2. If a car runs out of fuel, its speed increases. (.....)
3. The motion of a car is opposed by the gravity of air. (.....)

4 Write the scientific term of each of the following :

1. It is a force that is exerted when objects rub against each other. (.....)
2. It is a force that slows down the motion of moving objects. (.....)

5 Complete the following sentences :

1. A moving car is affected by the ..... force of both air and road which act in the ..... direction of the car movement.
2. We can say that a train is faster than a car if the ..... acting on the train is ..... than that acting on the car to move the same distance.
3. If you push each of a small ball and a big ball with the same force, the small ball moves a distance ..... than the big ball.
4. In tug-of-war game, the rope moves toward the group which has pulling force ..... than the other group.
5. The speed of a ball moving on the ground decreases gradually until it stops due to the effect of ..... force.
6. When you kick a ball hard, it will move for a ..... distance but when you kick the same ball gently, it will move for a ..... distance.
7. If the same pulling force acts on two boxes of different sizes, the smaller box will move for a ..... distance.

6 Give reasons for :

1. When your toy car crashes into a wall, it will stop moving.

   .....

   .....

2. When you stop pedalling during the movement of your bicycle, it slows down until it stops.

   .....

   .....

3. If you push two similar toy cars on the same ground, one of them may travel for a longer distance than the other.

   .....

4. If the same force acts on a small car and a truck, the small car will travel for a longer distance than the truck.

   .....

7 What happens if ... ?

1. A car runs out of fuel on a flat road.

.....

.....

2. You push two similar balls with different forces on the ground.

.....

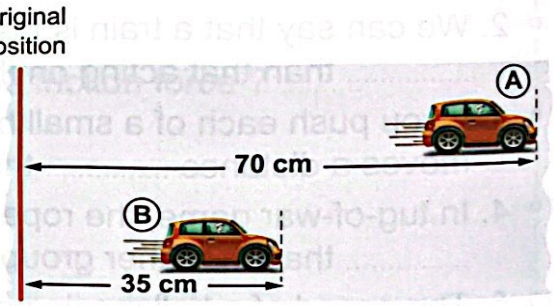
.....

8 The following figure shows two similar toy cars are pushed to move on the same floor, study the figure then answer the questions below :

1. Which of these two cars is affected by a greater force ? *(Cairo 2022)*
(Give a reason for your answer).

.....

.....



2. **Choose the correct answer :**

1. If the two cars were pushed by the same force, so .....
   a. car (A) would move for a longer distance than car (B).
   b. car (B) would move for a longer distance than car (A).
   c. the two cars would move the same distance.
   d. the two cars would not move.

2. If you replace car (A) with a new car which is larger than car (B), the new car will move a distance ..... the distance that covered by car (B).
   a. longer than b. shorter than
   c. equal to d. twice

3. The two cars during motion are affected by all the following forces, except .....
   a. the pushing force. b. the friction force of the air.
   c. the friction force of the floor. d. the pushing gravity force.

LESSON FOUR

Activity 9 Energy, Work and Force

▸ **Look at the opposite picture, then choose the correct answer:**

This man exerts a ..... force on the car to make it moves.

(pushing – pulling)

The relationship between energy, work and force :

▸ **Example :**

- The man exerts a pushing force on the car to move it.
- So, this force transfers energy from his body to the car.
- When he moves the car, this means that he is doing work.

▸ **From the previous example, we can conclude that :**

- Force transfers energy from one object to another.
- The work done is equal to the amount of energy transferred by a force that is used to move an object.

Force → Transfers → **Energy** → Enables us to do → **Work**

Note

Force and energy are different, but they are related to one another, where force is the effect that changes energy and allows it to do work.

Check your understanding

▸ **Complete the following sentences using the words below :**

(force – work)

1. To make an object start or stop moving, this requires .....
2. When you push a car and it starts to move, you are doing .....

relationship	صلة	flat road	طريق مسطح	enable us	تمكننا
work	شغل	transfer	ينتقل / يتحول	related to	متعلق بـ

Activity 10 Record Evidence Like A Scientist

- In this concept, you have learned a lot about the role of balanced and unbalanced forces in starting and stopping motion.
- **Now,** try to think like a scientist by writing your claim, your evidence and your scientific explanation about one of the main points of this concept through the four steps you have learned in the previous concepts.

Step 1 The Question

How do forces act on different objects to make them start moving and stop moving ?

Step 2 My Claim

.....

.....

.....

Step 3 My Evidence

.....

.....

.....

.....

Step 4 My Scientific Explanation

.....

.....

.....

.....

.....

Review on Concept (2.1)

To review this concept look at the **Assessment Book** "**Part 2 :** Final Revision".

In the Assessment Book :

Try to answer :

- Self-Assessment (17)
- Model Exam on Concept (2.1)

role	وظيفة / دور	evidence	دليل
claim	افتراض	scientific explanation	التفسير العلمى

Exercises on Lesson 4

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. All of the following examples can move by a pushing force, except .....
   a. a ball. b. a swing. c. tug-of-war rope. d. a car.
2. To stop a moving object we can apply a ..... against it.
   a. pushing force b. gravity force c. sound energy d. light energy
3. Samir pushed his toy car that moved forward, to stop it he should .....
   a. push it in the same moving direction.
   b. pull it with a small force in the same moving direction.
   c. pull it with a large force in the same moving direction.
   d. push it in a direction opposite to its moving direction.
4. The work done is equal to the amount of ..... transferred by a force that is used to move an object.
   a. energy b. friction c. pushing d. gravity

2 Put (✓) or (✗) :

1. If a person moves a table through a distance, there is a work done. ( )
2. Lifting a book upward needs more energy than pushing a truck. ( )
3. If you try to open a door but you cannot open it, this means that work is done. ( )
4. Hitting a tennis ball needs a pulling force. *(Giza 2023)* ( )

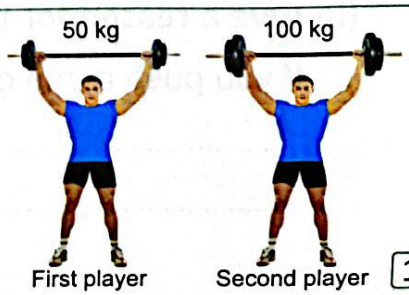
3 Complete the following sentences :

1. When you push a table to move on the floor, your pushing force transfers ..... from your body to the table.
2. Any force applied to an object is considered as the effect that changes ..... and allows it to do ..... done by this object.
3. The work done on a basketball is equal to the amount of ..... transferred from the player hand to the ball.
4. To stop the rolling ball on the ground, you need to exert a ..... equal to that exerted by the ball in the opposited direction.

4 In the opposite figure, which of the two players does more work to raise the weights ? (Give a reason for your answer).

.....

.....



Model Exam 1 on Concept (2.1)

Total mark: 15

1 (A) Choose the correct answer : *(5 marks)*

1. Mona throws her ball up in the air so, gravity will make the ball move .....
   a. forward. b. upward. c. downward. d. backward.
2. Which situation represents the best example of gravity ? .....
   a. A car hits a tree and its motion stops.
   b. A wind blows and a sailboat moves.
   c. A book is pushed to move across a table.
   d. A person drops a ball that falls to the ground.
3. The speed of the Shockwave truck is more than that of the .....
   a. normal truck only. b. jet airplane only.
   c. normal truck and rocket. d. rocket and jet airplane.
4. All the following are examples of pushing force, except .....
   a. writing using a keyboard. b. lifting a bag.
   c. kicking a ball. d. throwing a basketball.

(B) What happens if ... ?

The forces that are acting on the rope of tug-of-war game are balanced.

(according to the movement of the rope).

.....

2 (A) Put (✓) or (✗) : *(5 marks)*

1. Gravity pulls objects upward. ( )
2. The main difference between pulling and pushing forces is the direction of the force. ( )
3. We can't observe the movement of a person walking on the street. ( )
4. If you move a chair through a distance, there is work done. ( )

(B) Give a reason for the following :

If you push a pen on the table, it moves for a certain distance till it stops.

.....

.....

3 (A) Correct the underlined words : *(5 marks)*

1. By increasing the pushing force acting on a moving toy car, it will move for a short distance. (.....)
2. Any moving object stops when a force of the same amount is applied on it in the same direction of its movement. (.....)
3. To increase the speed of the Shockwave truck, engineers installed three parachutes in it. (.....)
4. A table stays without any motion due to the unbalanced forces that are acting on it. (.....)

(B) Look at the opposite picture, then complete the following sentences :

1. The person in this picture uses ..... to land safely.
2. The idea of person landing in this picture is the same as the idea of stopping the motion of ..... and .....

Model Exam 2 on Concept (2.1)

Total mark
15

1 (A) Complete the following sentences : *(5 marks)*

1. When we put a jet engine in a normal truck, its speed will .....
2. The bicycle cannot move without a ..... acting on it.
3. When you push a toy car on the ground, its speed decreases gradually until it stops due to the effect of ..... force.
4. To stop a moving toy truck on the ground, you need to exert a ..... equal to that exerted by the toy truck in the opposited direction.

(B) Give a reason for the following :

If a ball moves on the flat road, its speed decreases till it stops.

.....

.....

2 (A) Write the scientific term of each of the following : *(5 marks)*

1. The type of force that is used in tug-of-war game. (.....)
2. It is the force that causes any object falls down toward the ground. (.....)
3. It is the engine that is used in the Shockwave truck to allow it moves fast. (.....)
4. It is a force that is exerted when objects rub against each other. (.....)

(B) What happens if ... ?

A car and a truck are affected by the same pushing force.

.....

.....

3 (A) Choose from column (B) what suits it in column (A) : *(5 marks)*

(A)	(B)
1. Friction force	a. are the forces that act on any object to make it moves.
2. Balanced forces	b. is the force that act in the opposite direction of the object's movement to stop it.
3. Unbalanced forces	c. is the force that causes any object falls down toward the ground.
4. Gravity force	d. are the forces that act on any object that does not move.
	e. is the force that act in the same direction of the object's movement to stop it.

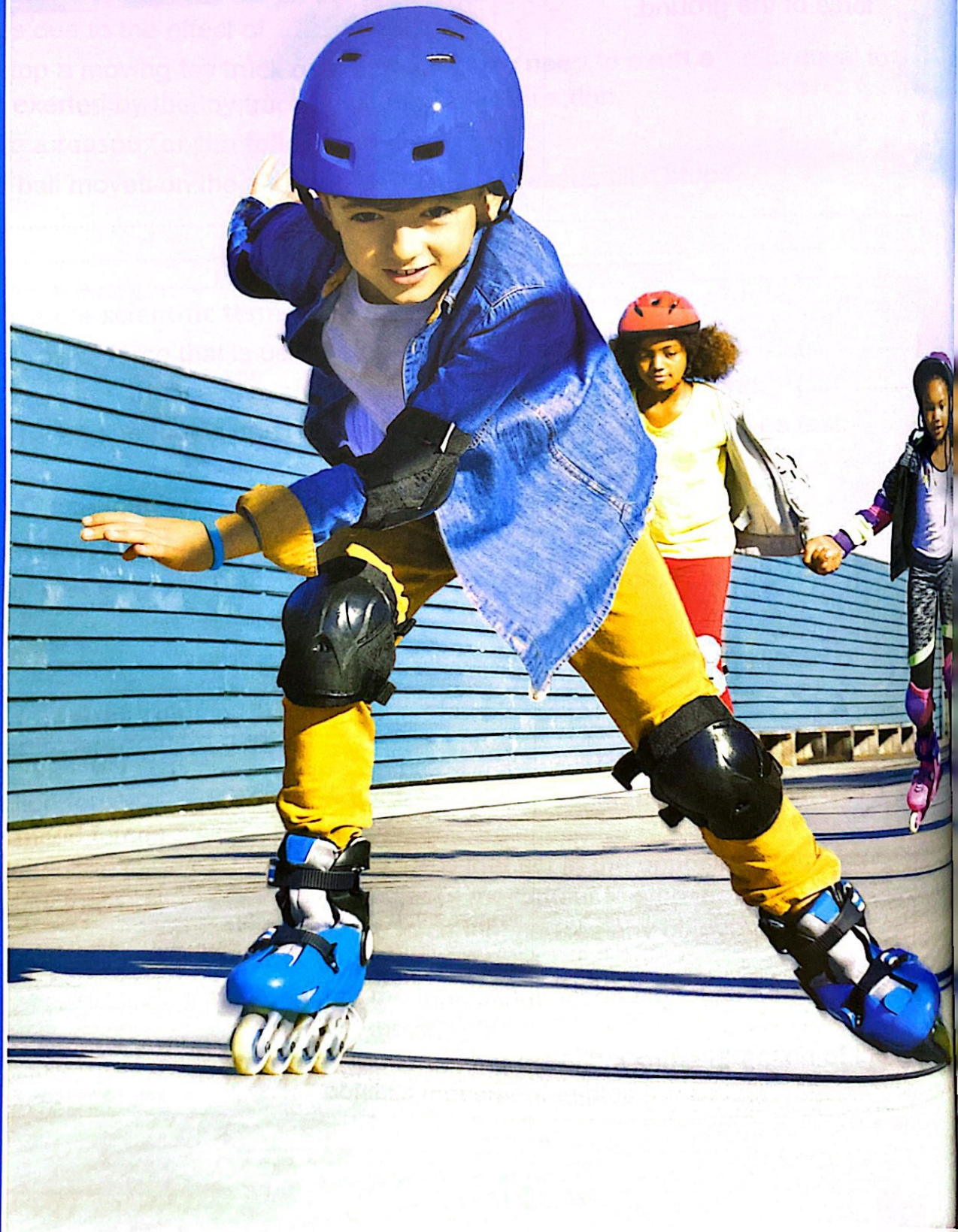
1. ..... 2. ..... 3. ..... 4. .....

(B) Look at the opposite picture that shows a boy moves a car forward, then complete the following sentences :

1. The car moves as a result of ..... force that is applied by the boy.
2. During the movement of the car, it is opposed by the friction force of ..... and the friction force of the ground.

Concept

2.2 Energy and Motion



Learning outcomes

By the end of this concept, your child will be able to :

- Investigate the forms of energy in a system or for an object.
- Apply logical reasoning to predict the types of energy for an object.
- Cite evidence to explain how energy is conserved.

Key vocabulary

- Kinetic energy
- Potential energy
- Chemical energy
- Gravitational potential energy
- Thermal energy

Notes For Parents On Concept [2.2]

Lessons	Activities	What you should do with your child
1	Activity 1	Let your child mention some examples of objects that have kinetic energy and potential energy.
	Activity 2	Discuss with your child the different types of energy in the roller coaster during its movement.
	Activity 3	Discuss with your child the different forms of energy and let him/her mention some examples of each of them.
2	Activity 4	Explain to your child the relationship between energy and work.
	Activity 5	Explain to your child the meaning of "potential energy" and "kinetic energy".
3	Activity 6	- Explain to your child that all forms of energy are classified into two main groups which are potential energy and kinetic energy. - Discuss with your child that potential energy depends on the mass of an object and its height from the Earth's surface.
	Activity 7	Let your child mention the changes of energy in some devices.
4	Activity 8	Explain to your child the concept of : "energy is not created or destroyed".
	Activity 9	Help your child to think like a scientist by answering a question about one of the main points of this concept, then write his/her claim, evidence and scientific explanation.

LESSON ONE

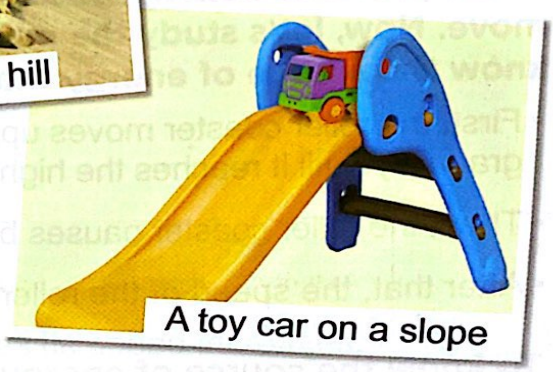
Activity 1 Can You Explain ?

Running down a sand hill

Figure 1

A player kicks a ball

Figure 2



A toy car on a slope

Figure 3

In the previous concept, you have learned that :

Objects need a force to move or stop and this force applied on objects needs energy to be able to do work, so how do moving objects get energy ?

- **The pictures above show :**
- A sand surfer moves very fast down the sand hill in figure 1.
- The ball moves through the air when the player kicks it with his foot in figure 2.
- The toy car at the top of slope will not move if no force is applied on it in figure 3.

From the previous observations, we can conclude that :

- All moving objects have a type of energy known as kinetic energy.
- Objects that do not move don't have kinetic energy but they have another type of energy known as potential energy that is stored in them. When these objects start to move, they get kinetic energy.

In this concept, we will study :

- The meaning of energy and its basics.
- Types of energy.
- Kinetic energy and potential energy.

hill	تل	force	قوة	sand surfer	مُتزلج على الرمال	potential energy	طاقة وضع
slope	منحدر	energy	طاقة	kinetic energy	طاقة حركة		

Activity 2 Roller Coasters

In your opinion, which of the following energies is responsible for the movement of the roller coaster (train) ?

a. Kinetic energy. **b.** Sound energy.

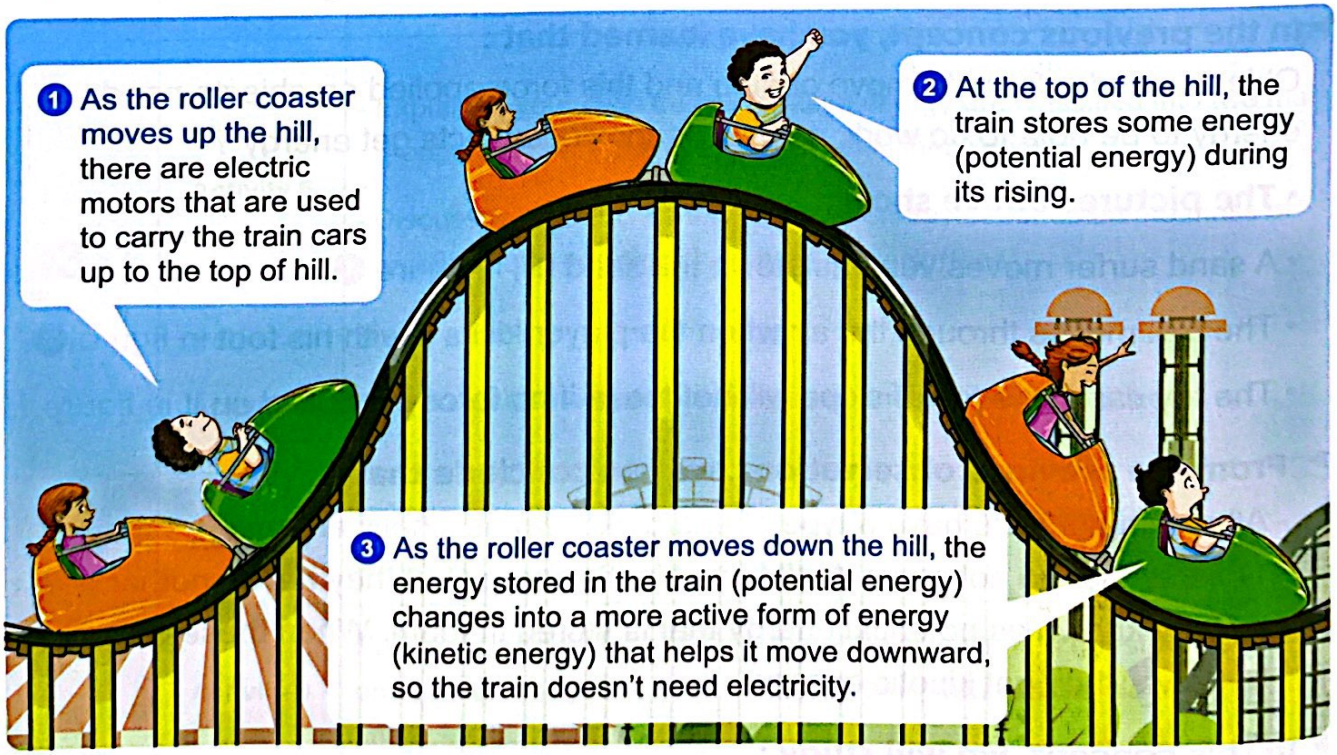
c. Light energy. **d.** Thermal energy.

Roller coaster

▶ **In the previous activity, you have learned that objects need energy to move. Now, let's study the motion of the "roller coaster" as an example to know the source of energy that makes it move.**

- First, the roller coaster moves up the hill (ramp) slowly and its speed decreases gradually until it reaches the highest point.
- Then, the roller coaster pauses briefly at the top of the hill.
- After that, the speed of the roller coaster increases as it moves down the hill.

▶ **To know the source of energy that makes the train move with this speed, read the following steps :**



Note

While the roller coaster moves down the hill, the kinetic energy increases as its speed increases.

roller coaster	قطار الملاهى السريع	thermal energy	طاقة حرارية
gradually	تدريجيًا	briefly	لوقت قصير

▶ **From the previous explanation, we can conclude that :**

- When the roller coaster moves downward, its kinetic energy increases.
- The kinetic energy increases as the speed increases.

What happens if ... ?

- **A roller coaster moves from up to down. (according to its energy).**
  The stored potential energy in the train is changed into kinetic energy.
- **A roller coaster stops. (according to its kinetic energy).**
  Its kinetic energy becomes zero.

Check your understanding

▶ **Put (✓) or (✗) :**

1. Kinetic energy of a moving object increases as its speed increases. ( )
2. When a roller coaster moves from up to down, it has the most kinetic energy when it reaches the lowest point of the hill. ( )
3. When the roller coaster moves downward, its kinetic energy decreases. ( )

explanation تفسير conclude يستنتج

Activity 3 What Do You Already Know About Energy and Motion ?

- **From the previous activities, you can conclude that we need energy to do all our daily activities such as running, walking and even during reading a book.**

  So, energy is part of everything that happens in the world and everything we do.

- **Examples show the importance of energy in our life :**

1. We eat food to obtain energy to help us grow and move.

2. Energy affects objects and makes them move and change their places.

3. Energy helps in operating all electric devices.

4. Energy helps in cooking.

5. Energy helps in lighting houses and streets.

affects تؤثر | obtain يحصل على | operating تشغيل | daily يومي

Moving Energy :

- **Energy moves (transfers) from an object to another as in the example below that shows a player kicks a ball as shown in the following steps :**

1. The kinetic energy transfers from the player's foot to the ball when he kicks it.

2. Then, the ball moves in the air as a result of the transfer of kinetic energy to it.

3. Then, the kinetic energy transfers from the ball to the goal net which vibrates as a result of the transfer of kinetic energy to it.

Note

Any stopped object on the Earth's surface as in figure (1) has no energy. Any object at a height from the Earth's surface as in figure (2) has a special type of energy known as potential energy.

Figure (1)

Figure (2)

Check your understanding

▸ **Put (✓) or (✗) :**

1. Energy affects objects and makes them move and change their places. ( )
2. Energy doesn't transfer from an object to another. ( )

In the Assessment Book :
Try to answer :
Self-Assessment (18)

transfers تنتقل kicks يركل

Exercises on Lesson 1

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. When a sand surfer moves down the hill, this means that he has ....., due to his movement.
   a. kinetic energy
   b. stored light energy
   c. potential energy
   d. stored electrical energy
2. Human needs ..... to walk from one place to another.
   a. light energy
   b. energy obtained from food
   c. sound energy
   d. energy obtained from batteries
3. Electric motor in the roller coaster helps it to .....
   a. move up to the top of the hill.
   b. move down to the bottom of the hill.
   c. stop at the top of the hill.
   d. stop at the bottom of the hill.
4. When an object moves down a ramp, its stored potential energy .....
   a. increases.
   b. doesn't change.
   c. changes to a less active form of energy.
   d. changes to a more active form of energy. *(Alexandria 2023 / Assuit 2022)*
5. When the roller coaster goes up, its speed .....
   a. decreases as it goes down.
   b. decreases as it reaches the top of the hill.
   c. is more than its speed when it goes down.
   d. increases as it reaches the top of the hill.
6. When a wheelchair and a car go up a ramp, which of them can store some energy ? .....
   a. The wheelchair only.
   b. The car only.
   c. Both of them.
   d. None of them.
7. The roller coaster has the most energy of motion, ...
   a. as it goes up to the top of the hill.
   b. as it goes down the hill.
   c. when it stops at the top of the hill.
   d. when it stops at the bottom of the hill.
8. When the roller coaster stops, its energy of motion .....
   a. doesn't change.
   b. increases.
   c. decreases.
   d. becomes zero.

9. When a car moves up a ramp, this happens due to the effect of .....
   a. gravity force. b. balanced force.
   c. kinetic energy. d. sound energy.
10. The type of energy that allows objects to move is known as .....
   a. light energy. b. potential energy.
   c. solar energy. d. kinetic energy.

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. When a wheelchair goes down a ramp,	a. it is under the effect of balanced force, and it doesn't store energy.
2. When a wheelchair stops at the top of a ramp,	b. it has only energy of motion.
3. When a wheelchair stops at the bottom of a ramp,	c. it is under the effect of unbalanced force, where it loses its stored energy.
	d. it is under the effect of balanced force, and it stores energy.

1. ..... 2. ..... 3. .....

3 Put (✓) or (✗) :

1. We eat food to obtain energy. ( )
2. Energy doesn't transfer from an object to another. ( )
3. When a stopped object is affected by two opposite equal forces, it will not move. ( )
4. If a wheelchair moves horizontally on the ground, its energy of motion equals zero. ( )
5. The moving objects only have energy, while the objects that don't move have no energy. *(Giza 2022)* ( )

4 Write the scientific term of each of the following :

1. The form of energy that the object has due to its movement. (.....)
2. The form of energy that increases when the speed of an object increases. *(Sohag 2022)* (.....)

5 Correct the underlined words :

1. When a roller coaster moves down a ramp, its kinetic energy doesn't change. (.....)

2. If you push a pencil upward, it stops at a certain height then falls down due to the effect of pushing force of gravity. (.....)
3. When an object moves down, it has an active form of energy known as potential energy. (.....)
4. Under the effect of pushing force of gravity, anything falls down to the ground. (.....)
5. Balanced forces cause stopped objects to move. (.....)
6. Your potential energy is transferred from your foot to a ball when you kick it. (.....)

6 Complete the following sentences :

1. When the roller coaster starts to move, it gets energy from .....found in its first car which is operated by .....
2. The speed of a roller coaster when it moves toward the top of the hill is ..... than that when it moves down the hill.
3. If the speed of an object decreases, this means that its kinetic energy .....
4. When the roller coaster moves up to the top of the hill, ... and ..... energies cause its motion.
5. When you kick a ball, the ..... energy of your foot transfers to it. So, it moves through the air.

7 Give reasons for :

1. The roller coaster doesn't need electricity during its movement down the hill.

.....

.....

2. The speed of the roller coaster increases as it moves down the hill.

.....

.....

3. The goal net vibrates when a ball hits it.

.....

.....

8 What happens to ...?

1. The energy of the roller coaster when it moves down the hill.

.....

.....

2. The roller coaster when it loses its kinetic energy.

.....

.....

3. The energy of a stopped ball at the top of a ramp starts to move down.

.....

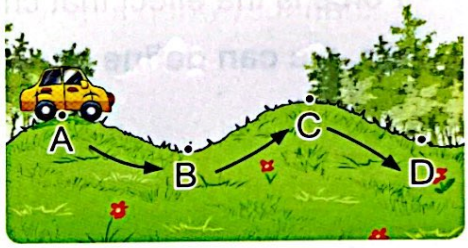
.....

4. The potential energy of an object when it is placed at a height from the Earth's surface.

.....

.....

9 Look at the following figure, then choose the correct answer :



1. The speed of the car increases when it .....
   a. stops at point (A).
   b. moves from (A) to (B).
   c. stops at point (C).
   d. moves from (B) to (C).

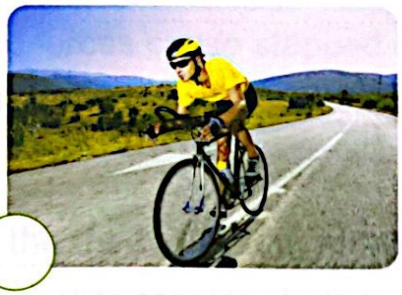
2. The speed of the car decreases when .....
   a. it moves from (A) to (B).
   b. its kinetic energy doesn't change.
   c. its kinetic energy increases.
   d. it moves from (B) to (C).

3. The kinetic energy of the car increases in all the following cases, except when the car .....
   a. moves from (A) to (B).
   b. moves from (C) to (D).
   c. moves from (B) to (C).
   d. speed increases.

LESSON TWO

Activity 4 Energy Basics

▶ **Observe these pictures, then put (✓) in front of the bodies that have energy.**



▶ **From the previous concept, you have learned that there is a relation between energy, force and work, where :**

- Force is the effect that changes energy to make it able to do work.
- **So, we can define energy and work as follows :**

Energy:

It is the ability to do work or cause change.

Work:

It is a force that causes an object to move a distance.

▶ **Example to show the relation between energy and work :**

- When a football player kicks a ball, the force of his kick causes the ball move in a different direction.
- Thus the player does work and he consumes energy (that he had obtained from food) to move his leg.
- So, the work done by this player causes the ball to move.

Facts about energy :

1. **Energy can be stored and changed from one form into another.**

   Example :

   When you hold a ball, it stores potential energy, when you let it fall down to the ground, the ball is moving where the potential energy stored in it is changed into kinetic energy.

basics	أساسيات	relation	علاقة	facts	حقائق	store	يخزن
work	شغل	consumes	يستهلك	hold	يمسك		

2 **We cannot see most forms of energy but, we can see and measure what energy can do.**

- We can't see most forms of energy such as : sound energy, thermal energy, electrical energy and chemical energy.
- We can see and measure what energy can do.

Example :

When you push a wooden box and this box moves, this means that the energy transfers from you to the box and also can be measured through the distance that the box moves.

Check your understanding

▸ Complete the following sentences :

1. The ability to do work is known as .....
2. The force that causes an object to move a distance is known as .....

▸ Put (✓) or (✗) :

1. Energy doesn't change from one form into another form. ( )
2. When you push a wall and this wall doesn't move, this means that you do work. ( )
3. The person who pushes a car forward and this car moves, this means that the person consumes energy. ( )

measure يقيس distance مسافة

Activity 5 Kinetic and Potential Energy

▶ **Scientists classify energy into two types which are :**

1 Potential energy

It is the amount of energy that is stored in an object due to its position.

Example :
The ball has potential energy stored in it when you lift it up away from the Earth's surface.

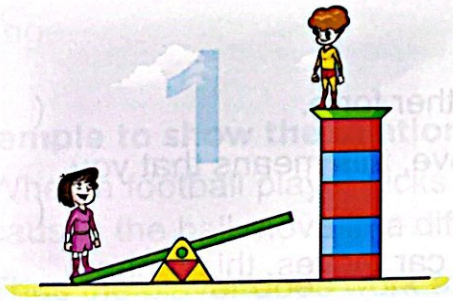
2 Kinetic energy.

It is the energy of an object due to its motion.

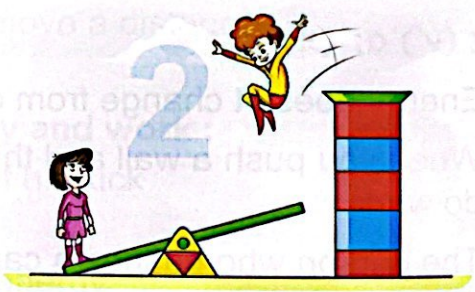
Example :
The ball has a kinetic energy when you let it fall down to the ground.

• **Now, let's see an example to find out how the potential energy can be changed into kinetic energy.**

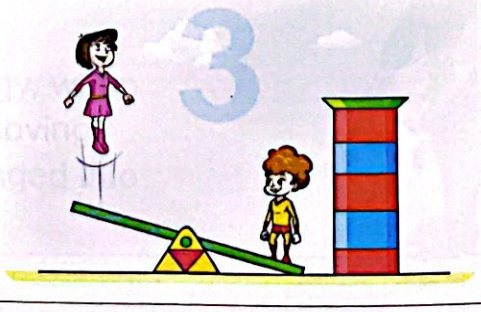
1 The boy on the tower has potential energy.



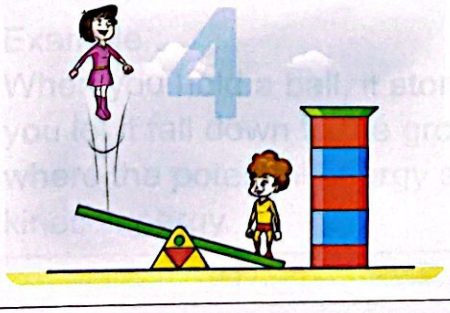
2 When he jumps down, his potential energy is converted into kinetic energy.



3 The kinetic energy of the boy transfers to the girl who is standing on the seesaw and causes her to be pushed up into the air.



4 During the movement of the girl up in the air, her kinetic energy is converted gradually into potential energy.



classify يصنف gradually تدريجيًا

Note

When an object has potential energy, so this object is ready to do work or to be active.

Check your understanding

Complete the following sentences :

1. Scientists classify energy into two types which are ..... energy and ..... energy.
2. The object has ..... energy stored in it when you lift it up away from the Earth's surface.

Put (✓) or (✗) :

1. When an object is placed at a high place, it stores kinetic energy. ( )
2. Any object that moves has kinetic energy. ( )

In the Assessment Book :
Try to answer :
Self-Assessment (19)

Exercises on Lesson 2

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. The form of energy that is stored in a book placed on a table is known as ..... energy.
   a. potential b. thermal c. light d. sound
2. The energy of an object due to its motion is known as ..... energy.
   a. sound b. thermal c. potential d. kinetic
3. The energy that is stored in an object due to its position, is known as ..... energy. *(Giza 2023 / Alexandria 2022)*
   a. kinetic b. potential c. electrical d. chemical
4. The form of energy that can be seen is ..... energy.
   a. thermal b. electrical c. light d. sound
5. When you throw a stone in a lake, the ..... is transferred from the stone to the water surface.
   a. potential energy b. pulling force
   c. gravity force d. kinetic energy
6. When a ball on a certain height is left to fall down, ...
   a. its kinetic energy changes into potential energy.
   b. its potential energy changes into kinetic energy.
   c. its potential energy remains as it is.
   d. its kinetic energy remains as it is.
7. A stopped object placed at 10 meters high from the Earth's surface has ..... than the same object when it is placed at the ground.
   a. smaller potential energy b. larger potential energy
   c. smaller kinetic energy d. larger kinetic energy

2 The following table shows Samy in different situations. Choose from column (B) the type and the amount of energy that suits each situation in column (A) :

(A)	(B)
1. Samy stops at 5 meter high	a. he has a stored electrical energy.
2. Samy stops on the ground	b. he does not have potential or kinetic energies.
3. Samy walks slowly on the Earth's surface	c. he has a large amount of kinetic energy.
4. Samy runs fast on the Earth's surface	d. he has an amount of potential energy.
	e. he has a small amount of kinetic energy.

1. ..... 2. ..... 3. ..... 4. .....

3 Put (✓) or (✗) :

1. We can see all the forms of energy. ( )
2. Energy can be stored in the form of potential energy. ( )
3. Any moving object has a form of energy known as kinetic energy. ( )

(Alexandria 2023)

4. When an object is left to fall down to the Earth's surface, its potential energy is changed into kinetic energy. ( )
5. We can measure the distance that an object moved as a result of pushing force. ( )
6. To do work, you must push or pull an object for a certain distance. ( )
7. If an object has energy so, it has the ability to do work. ( )

4 Write the scientific term of each of the following :

1. The energy that is stored in an object due to its position at a certain height from the Earth's surface. *(Luxor 2023 / Cairo 2022)* (.....)
2. The energy that the object gains due to its motion. *(Luxor 2023 / Minia 2022)* (.....)
3. The ability to do work or cause change. *(Alexandria 2023 / Ismailia 2022)* (.....)
4. The force that makes an object to move over a distance. (.....)
5. The energy that is changed into kinetic energy when an object falls down to the Earth's surface. (.....)

5 Correct the underlined words :

1. The ability to do force or cause change is known as energy. (.....)
2. We cannot see all forms of energy, except thermal energy. (.....)
3. As the object moves faster, its potential energy increases. (.....)
4. The energy form stored in a stopped wooden box placed on a table is kinetic energy. (.....)

6 Complete the following sentences :

1. If you have the ability to push a chair, so you have .....
2. When a force moves a ball over a distance, we can say that ..... is done.
3. If you let an object fall down from a high place so, its ..... energy changes into kinetic energy.

4. When an apple falls from a tree, its ..... energy will decrease.
5. Some types of energy can be seen such as ..... energy, while some other types of energy can't be seen such as ..... and ..... energies.
6. If an object is placed at a height above the Earth's surface, it stores ..... energy.
7. If a bird flies from the ground up to a high tree, its potential energy will .....
8. If you move a bag placed on a table to the floor, its potential energy will .....

7 Give reasons for :

1. A bird stops on a tree has energy.

.....

.....

2. When a stone is thrown upwards, its potential energy increases.

.....

.....

8 What happens if ... ?

1. An apple falls from a tree to the ground. (according to the change in its energy).

.....

.....

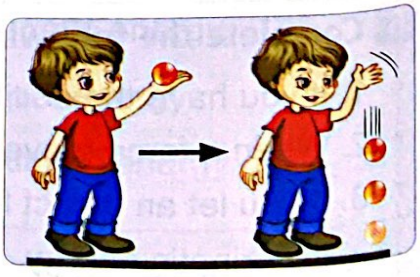
2. You transfer a book from the ground to a higher shelf. (according to its potential energy).

.....

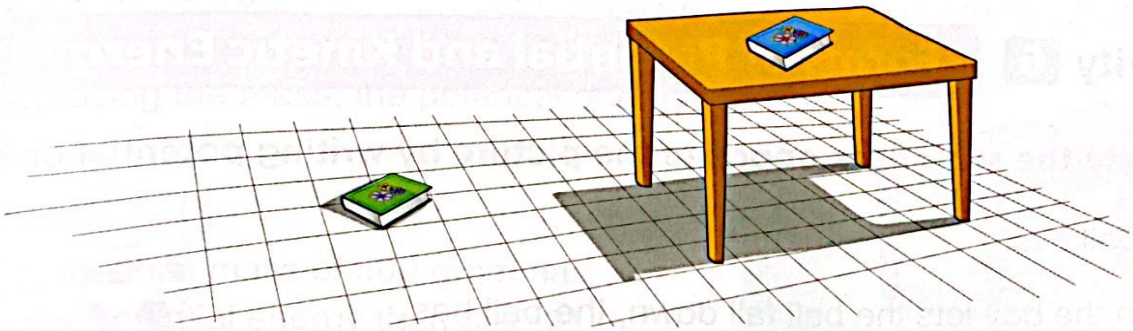
.....

9 Look at the opposite figure, then complete the following sentences :

1. When the boy lets the ball fall down, the ..... energy which is stored in the ball changes into ..... energy.
2. When the ball hits the floor and bounces up, its ..... energy will increase as it rises up.



10 Look at the figures below, then choose the correct answer :



Book (a) Book (b)

1. According to the potential energy, which of the following statements is correct ? .....
   a. The two books have the same potential energy.
   b. Book (a) has more potential energy.
   c. Book (b) has more potential energy.
   d. The two books have no potential energy.

2. If you transfer the book (a) onto table, its potential energy will .....
   a. increase. b. decrease. c. not change. d. be zero.

11 Look at the two opposite figures, then choose the correct answer :

1. In figure (a), the acrobat (1) has .....
   a. potential energy more than that of acrobat (2).
   b. potential energy less than that of acrobat (2).
   c. potential energy similar to that of acrobat (2).
   d. no potential energy like acrobat (2).

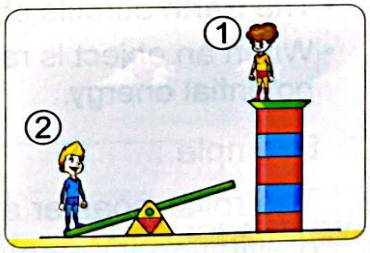


Figure (a)

2. In figure (b), during the rising up of the acrobat (2) into the air, his .....
   a. potential energy decreases.
   b. potential energy increases.
   c. potential and kinetic energies increase.
   d. potential and kinetic energies decrease.

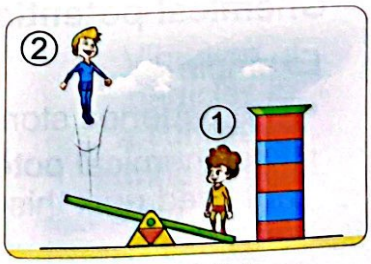


Figure (b)

LESSON THREE

Activity 6 Forms of Potential and Kinetic Energy

▸ **Complete the sentences opposite the picture by writing potential or kinetic.**

1. The ball has ..... energy.
2. When the boy lets the ball fall down, the ball has ..... energy.

▸ **In the previous activities, you have learned that there are two categories of energy which are kinetic and potential energies.**

• In this lesson, we will study some forms of potential and kinetic energies.

Forms of potential energy

① **Gravitational potential energy**

② **Chemical potential energy**

Gravitational potential energy

• The Earth attracts objects to its surface by a force called gravitational force (gravity).

• When an object is raised up against the Earth's gravity, this object stores gravitational potential energy.

Example :

The roller coaster at the top of a hill stores gravitational potential energy.

Chemical potential energy

Example :

• The batteries store chemical potential energy.

• The chemical potential energy stored in the battery is not used until this battery is connected to a device.

Note

When a spring is compressed, it stores potential energy inside it.

Spring

gravity الجاذبية | connected متصلة | spring زنبرك | compress يضغط

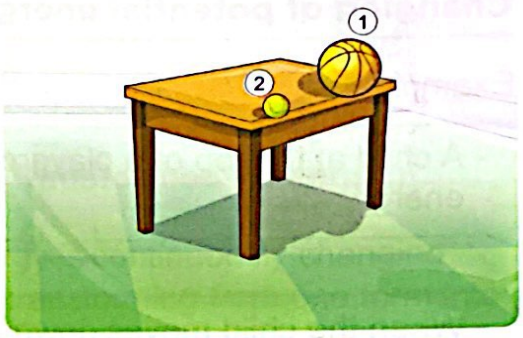
Factors affecting potential energy of an object :

1 Mass

By increasing the mass, the potential energy increases.

Example :

Ball (1) that has mass of 500 gram has a greater potential energy than ball (2) that has mass of 40 gram.

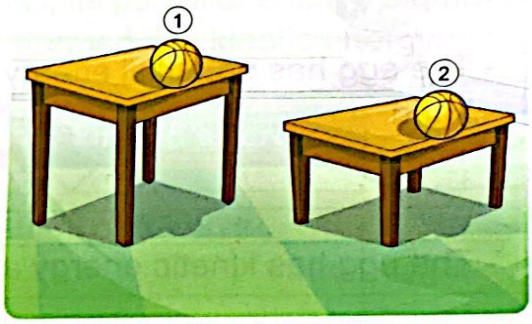


2 Height

By increasing the height from the Earth's surface, the potential energy increases.

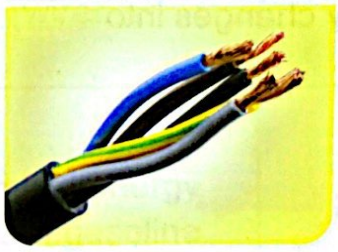
Example :

Ball (1) at height 1 meter has a greater potential energy than ball (2) at height $\frac{1}{2}$ meter.



Forms of kinetic energy

1 Sound energy	2 Light energy	3 Electrical energy	4 Thermal energy
as	as	as	as
Movement of sound waves in the air.	Movement of light waves in the air.	Movement of electricity through wires.	Vibration of particles in a substance during heating.



mass كتلة | sound waves موجات الصوت | light waves موجات الضوء | vibration اهتزاز

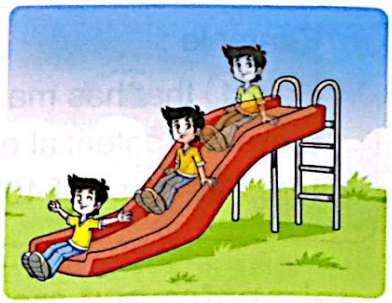
▸ **From the previous lessons, you have known that energy is transformed (changed) easily from one form into another form such as :**

Changing of potential energy into kinetic energy:

Example 1 :

- A child at the top of a playground slide has potential energy.

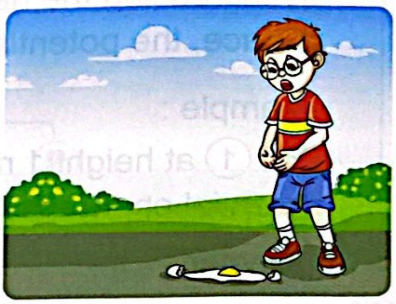
- When the child moves down along the slide, the **potential energy changes into kinetic energy.**



Example 2 :

- The egg has potential energy when it is in the boy's hand.

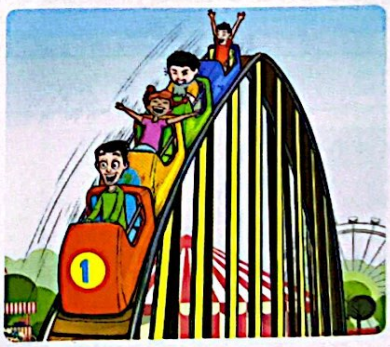
- The egg has kinetic energy as it falls down.



Check your understanding

▸ **Look at the opposite picture, then complete the sentences using these words :**

(kinetic – potential)



1. When the roller coaster is at the top of the hill, it stores ..... energy.
2. When the roller coaster goes down the hill, its potential energy changes into ..... energy.

playground ملعب slide زحليقة

Activity 7 Types of Energy

- Energy is found everywhere around us.

Energy can be

Transferred

- Energy is transferred from one place to another.

Example :

When you kick a ball, kinetic energy of your leg is transferred to the ball.

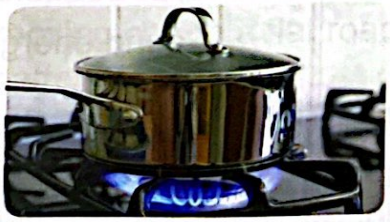
Transformed (changed)

- Energy is continuously changing and transforming from one form into another form.

Example :

When the roller coaster goes down the hill, its potential energy is transformed into kinetic energy.

Some changes of potential energy into kinetic energy

Example	Energy changes	
	From	Into
Flashlight 	Chemical energy stored in batteries.	Light energy and thermal energy (heat).
Gas oven 	Chemical energy stored in natural gas.	Thermal energy.
Spring-powered car toy 	Potential energy stored in the spring wire.	Kinetic energy, sound energy and thermal energy.
Real car 	Chemical energy stored in gasoline.	Kinetic energy.

oven فرن natural gas غاز طبيعي gasoline بنزين

▶ **From the previous explanation, we can conclude that :**

- Energy can be stored in many different forms.
- New energy cannot be created and also existing energy cannot be destroyed.

Note

- The food you eat also stores chemical energy.
- When you eat food, your digestive system breaks down the food and changes it into energy stored in your body.

Check your understanding

▶ **Complete the following table :**

Example	Energy changes	
	From	Into
1. Electric fan :	Electrical energy	Kinetic energy
2. Door bell :	Electrical energy	.....
3. Radio :	.....	Sound energy
4. Electric lamp :	.....	.....

In the Assessment Book :
Try to answer :
Self-Assessment (20)

digestive system الجهاز الهضمى | create يخلق | door bell جرس الباب | destory يفنى

Exercises on Lesson 3

Understand Apply Higher Thinking Skills

1 Choose the correct answer :

1. A ball at the top of a hill stores ..... energy.
   a. sound b. light c. chemical d. potential
2. The stored energy in a battery of a flashlight changes into ..... , when it is turned on.
   a. chemical energy b. sound energy
   c. light energy d. potential energy
3. All the following examples store chemical energy, except .....
   a. food. b. natural gas. c. a battery. d. a compressed spring.
4. Energy can do all the following, except .....
   a. It can be stored in an object.
   b. It can be transferred from an object to another one.
   c. It can be transformed from one form into another one.
   d. It can be destroyed and cannot be created.
5. If an object stops at a certain height from the Earth's surface for two hours then falls down, this means that .....
   a. its potential energy will be destroyed before two hours.
   b. its kinetic energy will be destroyed after two hours.
   c. its stored potential energy will change into kinetic energy.
   d. its stored kinetic energy will change into potential energy.
6. All the following examples have stored potential energy, except .....
   a. a stopped roller coaster at the top of a hill.
   b. a moving car on a flat road.
   c. a battery of a car.
   d. a compressed spring of a toy.
7. All the following examples represent kinetic energy, except .....
   a. light waves moving through the air.
   b. sound waves moving through the air.
   c. stored chemical energy in a car battery.
   d. water particles movement during heating.
8. The potential energy of an object depends on ..... *(Cairo 2022)*
   a. its mass only.
   b. its height from the Earth's surface only.
   c. its mass and its height from the Earth's surface.
   d. its temperature.
9. The type of potential energy that stored in batteries is called ..... potential energy.
   a. chemical b. thermal c. gravitational d. light

10. All the following are forms of kinetic energy, except .....
    a. light energy.
    b. chemical energy.
    c. sound energy.
    d. electrical energy.

11. All types of energy can be classified into two main groups which are .....
    a. light energy and sound energy.
    b. chemical energy and electrical energy.
    c. potential energy and kinetic energy.
    d. magnetic energy and thermal energy. *(Cairo 2022)*

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Sound energy	a. changes into another form of energy that can be stored inside the human body.
2. Light energy	b. when it reaches our ears, it causes hearing.
3. Thermal energy	c. changes into electrical energy in a flashlight.
4. Stored chemical energy in food	d. is produced from electric heater.
5. Stored chemical energy in a battery	e. when it reaches the nose, it causes smelling.
	f. when it reaches our eyes, it causes vision.

1. ..... 2. ..... 3. ..... 4. ..... 5. .....

3 Put (✓) or (✗) :

1. New energy cannot be created, but existing energy can be destroyed. ( )
2. A compressed spring stores potential energy. ( )
3. As the height of an object from the Earth's surface increases, its potential energy increases. *(Suez 2023)* ( )
4. Kinetic energy cannot be transformed into potential energy. ( )
5. Light waves are form of potential energy. ( )
6. We can see the movement of electricity through a wire. *(Suez 2023)* ( )
7. You can change kinetic energy into stored potential energy when you compress a toy spring. ( )
8. In gas oven, the chemical energy is changed into thermal energy. ( )
9. Objects that have the same masses and placed at the same height, have the same potential energy. ( )

4 Write the scientific term of each of the following :

1. It is the stored potential energy in a car battery. (.....)
2. It is a form of kinetic energy that can move through the air and we can see it. (.....)
3. It is a form of kinetic energy due to vibrations of particles in a substance as it heats up. (.....)
4. It is a form of potential energy that pulls objects towards the Earth's surface. (.....)

5 Correct the underlined words :

1. When an object falls from a certain height, its stored potential energy changes into chemical energy. (.....)
2. The energy that is resulted due to the vibration of particles in a substance as it heats up, known as sound energy. (.....)
3. As the height of an object from the Earth's surface decreases, its potential energy increases. (.....)
4. Thermal, chemical, electrical and light energies are forms of kinetic energy. (.....)
5. A car battery stores a form of kinetic energy known as chemical energy. (.....)
6. A fan turns the chemical energy stored in natural gas into thermal energy. *(Alexandria 2022)* (.....)

6 Complete the following sentences :

1. Among the forms of potential energy ..... and ..... energies, while ..... energy is a form of kinetic energy.
2. The energy which is stored in a ball at the top of a hill is ..... potential energy. *(Cairo 2022 / Kafr El-Sheikh 2022)*
3. Thermal energy is considered as one of the forms of ..... energy.
4. Some forms of kinetic energy travel in air in the form of waves such as ..... and ..... energies.
5. Electrical energy is changed in loudspeakers into ..... energy, while it is changed in the electric fan into ..... energy.
6. In the electric bell, ... energy changes into ..... energy.
7. The chemical energy in the battery of a flashlight can be changed into ..... and ..... energies.
8. In gas oven, ... energy changes into ..... energy. *(Giza 2022)*
9. When a ball is on a table, it stores ..... energy, while as it falls down to the ground, this energy changes into ..... energy.

10. When you clap your hands, the kinetic energy changes into ..... energy, while when you rub your hands together, the kinetic energy changes into ..... energy.
11. Fireworks produce sound and ..... energies which are considered as forms of ..... energy.
12. Television needs ..... energy to be operated and changes it into ..... and ..... energies which are forms of kinetic energy.

7 Give reasons for :

1. Electric lamp produces different forms of energy.

.....

2. On winding up the spring of a toy car, then let it free, the car moves.

.....

8 What happens if ... ?

1. You operate a washing machine. (according to the change of energy).

.....

2. A boy moves down the slide. (according to the change of energy).

.....

3. You switch on an electric lamp. (according to the change of energy).

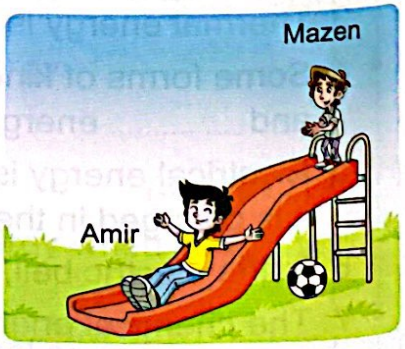
.....

9 Cross out the odd word :

1. Sound energy – Electrical energy – Thermal energy – Chemical energy. (.....)
2. Sound energy – Light energy – Electrical energy – Thermal energy. (.....)

10 Look at the opposite figure, then choose the correct answer :

1. Mazen has a big amount of .....
   a. potential energy. b. kinetic energy.
   c. both potential and kinetic energies.
   d. both potential and light energies.
2. Which of the following sentences is correct ? .....
   a. Amir has kinetic energy more than that of Mazen.
   b. Amir has potential energy more than that of Mazen.
   c. Amir has kinetic energy equal to that of Mazen.
   d. Amir has potential energy equal to that of Mazen.
3. The potential energy of the ball is .....Amir.
   a. more than that of b. equal to the kinetic energy of
   c. equal to that of d. less than that of



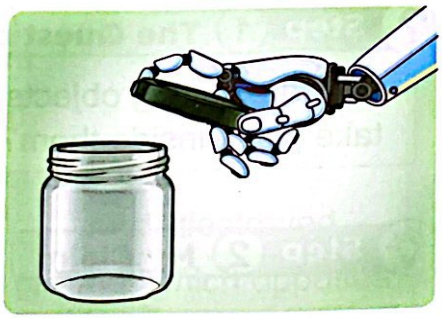
LESSON FOUR

Activity 8 Easy Life Tool

- You have learned a lot about different forms of energy and how they can transform from one form into another.
- **Now**, you can use this knowledge to design a tool that helps us to do work.

Example :

- **The tool :** A robot hand
- **Its function :**
  Opening the jar cap that it is hard to be opened.
- **The source of energy :**
  The robot gets power from batteries when it is turned on.



The changes of forms of energy inside the robot :

The chemical energy stored in the batteries. → changes into → Electrical energy in the robot hand. → changes into → Mechanical (kinetic) energy when the robot hand moves to open the jar.

▸ **From the previous explanation, we can conclude that :**

- Energy is not created or destroyed when transferred from the battery to the robot hand.
- Energy is converted from one form (chemical energy) to another form of energy (mechanical energy) when the robot hand opens the jar.

Check your understanding

▸ Complete the following diagram that shows the changes of energy when you switch on a flashlight :

The ..... energy stored in batteries. → changes into → ..... energy that moves in the wires inside the flashlight. → changes into → ..... energy in the lamp of the flashlight.

easy life tool	أداة لحياة أسهل	jar cap	غطاء إناء	convert	يتحول
design	يصمم	robot	إنسان آلي		

Activity 9 Record Evidence like A Scientist

- In this concept, you have learned about energy, motion, forms of potential energy and kinetic energy, and energy transformation in engines.
- **Now**, try to think like a scientist by writing your claim, your evidence and your scientific explanation about one of the main points of this concept through the four steps you have learn in the previous concepts.

Step 1 The Question

How do moving objects get energy and what are the changes of energy that take place inside them?

Step 2 My Claim

.....

.....

Step 3 My Evidence

.....

.....

.....

Step 4 My Scientific Explanation

.....

.....

.....

.....

Review on Concept (2.2)

To review this concept look at the **Assessment Book** "**Part 2** : Final Revision".

In the Assessment Book :

Try to answer :
- Self-Assessment (21)
- Model Exam on Concepts (2.1) & (2.2)

evidence دليل claim افتراض

Exercises on Lesson 4

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. Chemical energy can be stored in ..... *(Giza 2022)*

a. food only. b. battery only.

c. television and food. d. food and battery.

2. Humans cannot live without ..... to obtain the needed energy for doing their activities.

a. reading books b. driving cars

c. watching television d. eating food

3. When you jump high, the force affecting you must be .....

a. balanced. b. unbalanced. c. created. d. destroyed.

4. The force that is found between a moving car and the ground, which opposes its movement is known as .....

a. pushing force. b. electrical energy.

c. magnetic energy. d. friction force.

5. When an object begins to move down a hill, the potential energy stored in it changes into .....

a. less active energy. b. more active energy.

c. light energy. d. electrical energy.

2 Choose from column (B) what suits it in column (A) : *(Cairo 2022)*

(A)	(B)
1. Food	a. It can be transformed into potential energy.
2. Kinetic energy	b. He has only kinetic energy.
3. Potential energy	c. It is the source of energy for humans.
4. When a child is running on the ground.	d. It is the stored energy in an object.
5. When a child is standing on the ground without moving.	e. He has no kinetic energy.
	f. It cannot be transferred into another form of energy.

1. ..... 2. ..... 3. ..... 4. ..... 5. .....

3 Put (✓) or (✗) :

1. Orange, potato and battery contain stored chemical energy. ( )
2. A car does work when it moves from one place to another. ( )
3. Burning of food inside our bodies produces energy that allow us to do our activities. ( )
4. Transformation of potential energy into kinetic energy during your sliding down on a slide, proves that the energy can be created but cannot be destroyed. ( )
5. The stored kinetic energy changes into potential energy, when the gravity pulls a ball in the air back down to the ground. ( )
6. Energy obtained from food is important for your body to move and do different activities. ( )
7. When you are jumping to a certain height, the mass of your body doesn't affect your potential energy. ( )

4 Write the scientific term of each of the following :

1. The type of fuel that is used inside the car to obtain kinetic energy. (.....)
2. The energy that is stored in both food and batteries. (.....)
3. The energy that is stored in your body during your jumping into the air. (.....)
4. The energy that is produced when an object begins to move. (.....)

5 What happens if ... ?

1. Food burns inside the human body.

.....

.....

2. You put a battery inside a flashlight, then you switch it on. (according to the change of energy).

.....

.....

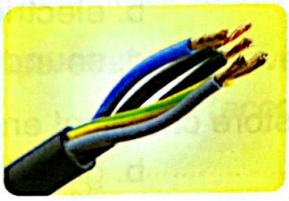
6 Write each of the following words in front of the suitable sentence below :

(Flashlight – Gas oven – Food)

1. Its burning changes the chemical energy into kinetic energy inside our bodies. (.....)
2. It changes chemical energy into thermal energy to be used in cooking. (.....)
3. It changes chemical energy into light and thermal energies. (.....)

7 Complete the following sentences below pictures :

changes into



changes into

1. Batteries inside the radio store ..... potential energy.
2. ..... energy in the wires inside the radio.
3. ..... energy produced from the radio speaker.

Model Exam 1 on Concept (2.2)

Total mark: 15

1 (A) Choose the correct answer : *(5 marks)*

1. When an object moves down a ramp, its stored potential energy .....
   a. increases.
   b. doesn't change.
   c. changes to a less active form of energy.
   d. changes to a more active form of energy.

2. The form of energy that can be seen is .....
   a. thermal energy.
   b. electrical energy.
   c. light energy.
   d. sound energy.

3. All the following examples store chemical energy, except .....
   a. food.
   b. gasoline.
   c. a battery.
   d. a compressed spring.

4. When you jump high in the air, the forces affecting you must be .....
   a. balanced.
   b. unbalanced.
   c. created.
   d. destroyed.

(B) Give a reason for the following :

Both the Sun and electric lamp produce two forms of energy.

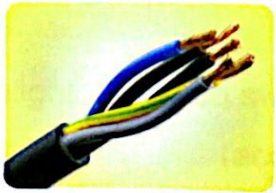
.....

2 (A) Put (✓) or (✗) : *(5 marks)*

1. The objects that don't move have no energy. ( )
2. To do work, you must push or pull an object through a certain distance. ( )
3. Light waves is a form of potential energy. ( )
4. Orange, potato and car battery contain stored chemical energy. ( )

(B) Complete the following sentences below pictures :

changes into



changes into

1. Batteries inside the radio store ..... potential energy.
2. ..... energy in the wires inside the radio.
3. ..... energy produced from the radio speaker.

3 (A) Correct the underlined words : *(5 marks)*

1. When an object falls down, it has more active form of energy known as potential energy. (.....)
2. Sound energy produced from the gas oven is used in cooking food. (.....)
3. A battery stores a form of kinetic energy known as chemical energy. (.....)
4. Gasoline contains electrical potential energy. (.....)

(B) What happens if ... ?

A stopped ball at the top of a slope starts to move down.
(according to the change of its energy)

.....

.....

Model Exam 2 on Concept (2.2)

Total mark 15

1 (A) Write the scientific term of each of the following : *(5 marks)*

1. The form of energy that the object has due to its movement. (.....)
2. The energy that is used to operate all electric devices. (.....)
3. The form of energy that is stored inside an object placed at a high place from the ground. (.....)
4. The energy that is stored in both food and batteries. (.....)

(B) Cross out the odd word :

Sound energy – Electrical energy – Thermal energy – Chemical energy. (.....)

---

2 (A) Choose the correct answer : *(5 marks)*

1. When you stop on the ground without moving, so you have .....
   a. the most kinetic energy. b. no kinetic energy.
   c. the most potential energy. d. the least light energy.

2. All the following forms of energy do not affect the movement of a moving object, except .....
   a. sound energy. b. light energy.
   c. electric energy. d. kinetic energy.

3. The most potential energy stored in an object, is that when it is .....
   a. moving on the ground.
   b. at the top of a hill.
   c. standing without movement on the ground.
   d. at the bottom of a hill.

4. The stored energy in a battery of a flashlight changes into ....., when it is turned on.
   a. chemical energy. b. sound energy.
   c. light energy. d. potential energy.

(B) What happens if ... ?

You switch on an elecric lamp. (according to the change of energy).

.....

(A) Put (✓) or (✗) :

(5 marks)

1. As the height of an object from the Earth's surface increases, its potential energy decreases. ( )
2. Energy doesn't transfer from an object to another. ( )
3. New energy cannot be created, but existing energy can be destroyed. ( )
4. Burning of food inside our bodies produces energy that allow us to do our activities. ( )

(B) Give a reason for the following :

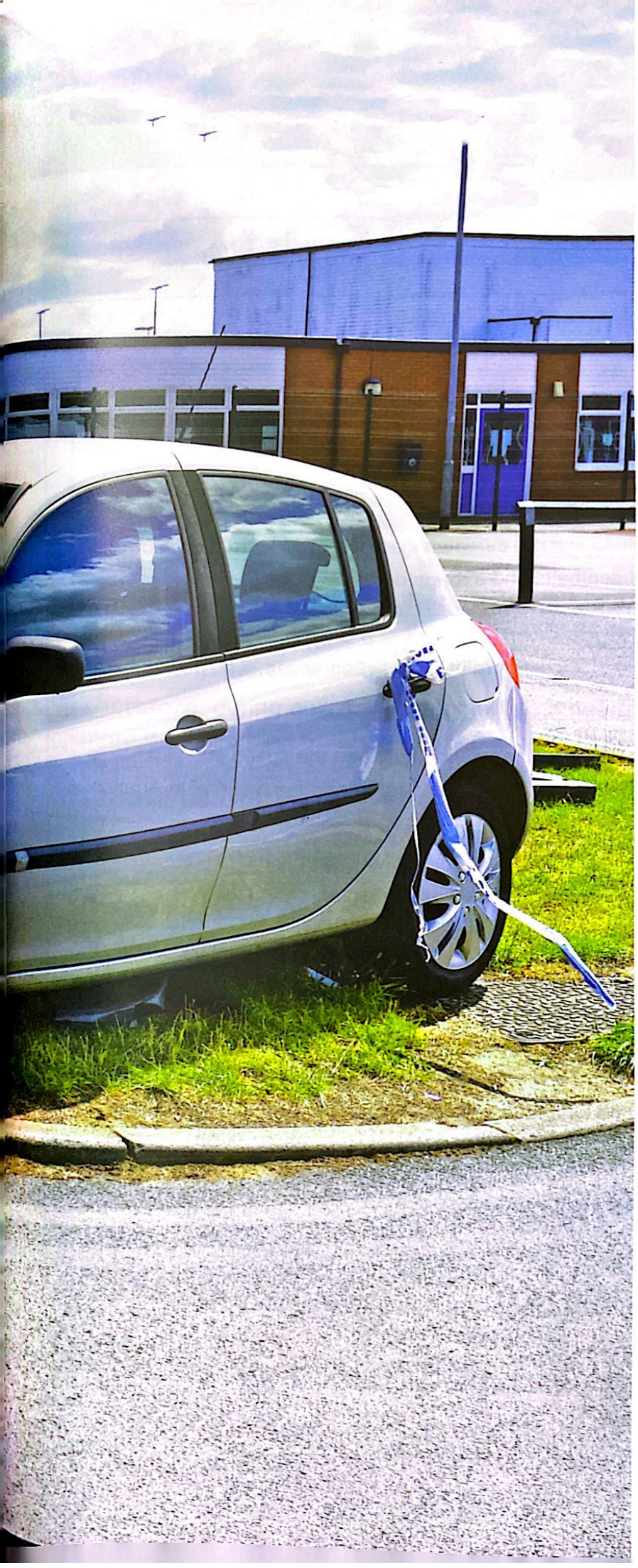
A bird stops on a tree has energy.

.....

.....

Concept

2.3 Energy and Collisions



Learning outcomes

By the end of this concept, your child will be able to :

- Analyze and interpret data to describe how the speed and mass of objects relate to changes observed in a collision.
- Construct an explanation based on evidence and logical reasoning to describe energy transfer in a collision.
- Apply mathematical thinking to organize data to represent patterns related to mass, speed and the energy of objects.

Key vocabulary

- Collision
- Mass
- Speed

Notes For Parents On Concept [2.3]

Lessons	Activities	What you should do with your child
1	Activity 1	Discuss with your child that faster and heavier objects have more energy than slower and lighter ones.
	Activity 2	Help your child to know that kinetic energy can transfer from one object to another.
	Activity 3	Help your child to find out some online sources to learn more about the importance of seatbelts and airbags during accidents.
2	Activity 4	Help your child to know the relation between speed, distance and time.
	Activity 5	Discuss with your child the relation between the speed and kinetic energy of an object that moves on a ramp and the angle of inclination.
3	Activity 6	Discuss with your child the meaning of collision and let him/her mention some examples of collision between objects.
	Activity 7	Discuss with your child the effect of speed on collision between objects.
4	Activity 8	Let your child to do a simple experiment to find out the relation between force, speed and kinetic energy of a moving object.
	Activity 9	Discuss with your child the effect of mass on collision between objects.
	Activity 10	Discuss with your child how kinetic energy transfers between objects.

LESSON ONE

Activity 1 Can You Explain ?

The truck (heavier object) has :
- More mass
- More speed
- More energy

The small car (lighter object) has :
- Less mass
- Less speed
- Less energy

▶ **What happens to objects when they collide with each other ?**

- In the example above, if the truck is the faster object it has more energy than the car which is the slower object.

Therefore, during collision, the object that has more energy (the truck) causes more damage than that has less energy (the car).

Example of collision :

A wrecking ball :

- It is a very heavy steel ball that swings on a cable.
- It is used to collide with walls of a building to help construction workers knock down walls or parts of buildings.

Wrecking ball

▶ **In this concept, we will study :**

- Collision of objects.
- Basics of speed.
- Energy and collision.
- The effect of speed and mass on collision.
- Energy conversions during a collision.

heavier	أثقل	mass	الكتلة	steel	فولاذ	knock down	يهدم
lighter	أخف	truck	شاحنة	damage	ضمار	basics	مبادئ
collision	اصطدام	wrecking ball	كرة الهدم	construction	البناء	swing	تتأرجح

Activity 2 Collision

▸ **Look at this picture, then put (✓) or (✗) :**

1. The ball transfer its kinetic energy to the bat. ( )
2. The ball will move in different direction, when the bat hits it. ( )

Collision in cricket :

- A cricket is a popular game all over the world.
- In cricket, a player uses a wooden bat to hit a ball.
- The cricket player holds a bat and moves it as the ball comes towards him at high speed to collide with the bat.

▸ **What happens to the energy of the moving bat when it hits the moving ball ?**

- The bat transfers its kinetic energy to the ball.
- Then, the speed of the ball increases and the ball returns back in a different direction.
- This collision produces a popping sound and the player would feel the bat hitting the ball.

Check your understanding

▸ **Put (✓) or (✗) :**

1. After collision between a ball and a bat, the direction of the ball will not change. ( )
2. During collision between a ball and a bat, the kinetic energy transfers from the bat to the ball. ( )

bat	مضرب	transfer	ينقل	popping sound	صوت فرقعة
hits	يضرب	popular	معروفة		

Activity 3 Watching Objects Collide

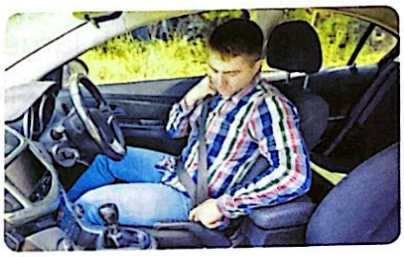
What happens to the driver's body when the car stops suddenly ?

- The driver's body continues to move forward where the objects that are in motion stay in motion until something stops them.
- **But,** What are the safety equipment that keep the driver and passengers in their places ?

Safety equipment used during collision of cars :

1 Seatbelts :

They are used in cars to keep the driver and also the passengers from moving forward when the car stops suddenly, so seatbelts have saved thousands of lives.



2 Airbags :

Their structure :

Airbags are made up of thin nylon material folded into the steering wheel, seats, dashboard or doors.

Idea of operation :

During collision	After collision
• Airbags inflate automatically when sensors in the car detect a crash. • A sensor tells the airbags to inflate and fill with a gas to provide a soft cushion.	• Airbags deflate almost as fast as they inflate, because they have holes (vents) to allow them to deflate, so the driver can get out of the car.

Their importance :

- Airbags slow the speed of the driver's motion forward.
- Airbags absorb the energy of the passengers on collision.

safety equipment	وسائل الأمان	suddenly	فجأه	steering wheel	عجلة القيادة	cushion	وسادة
seatbelt	حزام الأمان	inflate	تنتفخ	dashboard	تابلوه	passengers	راكبين
airbags	وسائد هوائية	absorb	تمتص	sensor	حساس	deflate	تنكمش

Give a reason for ...

Airbags deflat quickly after few seconds of collision.

- Because they contain small holes (vents), through which the gas comes out, so the driver can get out of the car.

Collisions between trains and cars :

- There are many accidents in which a train hits a car that may be stuck on the train tracks.
- Trains are much larger than cars. Also, trains can travel at a high speed.
- It is more dangerous, as the force of the collision between the car and train increases.

Check your understanding

Complete the following sentences :

1. Safety equipment of cars during collision include ..... and .....
2. Airbags are made up of thin ..... material.
3. In cars, ... protect passengers during collision where they inflate automatically when sensors in the car detect a crash.

In the Assessment Book :
Try to answer :
Self-Assessment (22)

stuck	عالق	accidents	حوادث	dangerous	خطر	crash	اصطدام

Exercises on Lesson 1

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. When objects collide with each other, ... is transferred between them.
   a. time b. distance c. energy d. nothing

2. The object that has the most kinetic energy, is ..... object.
   a. the fastest and lightest b. the slowest and lightest
   c. the fastest and heaviest d. the slowest and heaviest

3. A wrecking ball is made of .....
   a. plastic. b. nylon. c. steel. d. wood.

4. In cricket game, the bat transfers its ..... energy to the ball.
   a. kinetic b. potential c. thermal d. chemical

5. Collisions usually produce ..... *(Sohag 2023)*
   a. solar energy. b. sound energy.
   c. gravitational potential energy. d. chemical potential energy.

6. When the cricket bat hits the ball, the ball direction ..... and the ball speed .....
   a. doesn't change – doesn't change.
   b. doesn't change – changes.
   c. changes – doesn't change.
   d. changes – changes.

7. Seatbelts work when the car .....
   a. decreases its speed gradually. b. increases its speed gradually.
   c. suddenly stops. d. stops gradually.

8. If there is nothing to stop a moving object, this object will .....
   a. stay in motion. b. stop after few hours.
   c. stop after few minutes. d. stop after few seconds.

9. When a car that moves forward stops suddenly, the passengers move .....
   a. backward. b. forward. c. upward. d. downward.

(Cairo 2023)

10. Airbags in the car are folded into all the following places, except .....
    a. steering wheel. b. dashboard.
    c. doors. d. tires.

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Wrecking ball	a. it is one of the safety equipment in cars that is inflated with a gas during crashes.
2. Cricket bat	b. it changes its sound energy into light energy.
3. Seatbelt	c. it is used to hit a ball during playing.
4. Airbag	d. it is one of the safety equipment in cars that keeps passengers in their places during crashes.
	e. it is used to hit a wall during destruction of a building.

1. ..... 2. ..... 3. ..... 4. .....

3 Put (✓) or (✗) :

1. When a cricket bat hits the ball, its potential energy transfers to the ball. ( )
2. Seatbelt is one of the safety equipment in cars. *(Cairo 2023)* ( )
3. During a crash between two cars, the potential energy transfers from the faster car to the slower one. ( )
4. After car collision, the airbags deflate as fast as they inflate. ( )
5. When a fast car hits a very big tree, the kinetic energy of the car transfers into the tree. ( )

4 Write the scientific term of each of the following :

1. A heavy steel ball that swings on a cable and is used in destruction of parts of buildings. *(Luxor 2023)* (.....)
2. Safety equipment used to prevent car passengers from moving forward when the car stops suddenly. (.....)
3. Safety equipment used to provide soft cushion when it is inflated automatically with a gas during collision of cars. (.....)
4. They are present in car airbags and allow them to deflate fast after collision. (.....)

5 Correct the underlined words :

1. A fast and heavy object has more potential energy than a slow and light object. (.....)
2. Football is used to collide with buildings to knock down their walls. (.....)

3. When a train at a high speed hits a car, the train gets more damage. (.....)
4. As a result of hitting the ball with the wooden bat, the speed of the ball doesn't change. (.....)
5. Seatbelts absorb the energy of the passengers during collision when inflated. *(Sohag 2023)* (.....)
6. Airbags are made up of thick wooden material. (.....)
7. The cricket bat transfers its light energy to the ball. (.....)

6 Complete the following sentences :

1. When a bat hits a ball strongly, the ..... energy of the bat is transferred to the ball and the speed of the ball increases.
2. Among safety equipment which are used during collision of cars ..... and .....
3. As a result of collision between the ball and the bat, the direction of the ball will .....
4. During a car crash, the ..... is inflated with a gas to provide a soft cushion.
5. Airbags absorb the ..... of the passengers during collision.
6. When objects collide with each other, ... is transferred between them.
7. In cars, the ..... prevents passenger from moving forward when the car suddenly stops. *(Giza 2023)*

7 Give reasons for :

1. Seatbelts in cars are very important.
.....
2. Airbags in cars are very important.
.....
.....
3. The speed of the ball increases when the bat hits it hard.
.....

8 What happens if ... ?

1. The moving cricket bat hits a ball (according to the transfer of energy).
.....
2. Airbags in a car don't inflate during a crash.
.....

9 **Look at the opposite photo that shows a tennis player, then choose the correct answer :**

1. ..... energies are produced from the collision between the racket and the ball.
   a. Electrical and kinetic
   b. Kinetic and light
   c. Electrical and sound
   d. Kinetic and sound

2. When the racket hits the ball, the ..... of the ball is changed.
   a. size b. mass c. direction d. color

3. During hiting the ball with the racket, all the following sentences are correct, except .....
   a. the ball changes its direction.
   b. kinetic energy transfers from the racket to the ball.
   c. the speed of the ball changes.
   d. the size of the ball decreases.

---

10 **Look at the opposite photo that shows a crash between a train and a car, then answer the questions below :**

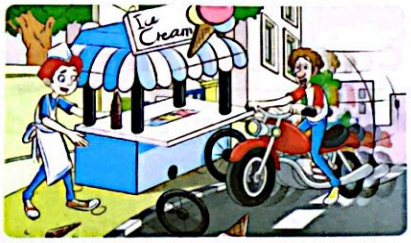
1. In your opinion, which one of them is damaged more than the other ? (Give a reason for your answer).
   .....
   .....

2. What happens to the car airbags during the crash ?
   .....
   .....

LESSON TWO

Activity 4 Basics of Speed

▸ **Look at this picture, then put (✓) or (X) :**



1. The speed of the motorcycle affect the amount of damage that will happen to the ice cream cart. ( )
2. The kinetic energy of the motorcycle transfers to the ice cream cart during collision. ( )

• In this activity we will study the meaning of speed and how we calculate it.

Basics of speed :

• Speed is a measurement of how fast something is moving.

Speed :

It is the distance that an object travels in a certain amount of time.

Calculating the speed :

• To calculate the speed of any moving object, we can divide the distance that the object moves by the time taken to travel that distance as follows :

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} \begin{matrix} \longrightarrow \text{(measured in Kilometer or meter)} \\ \longrightarrow \text{(measured in hour or second)} \end{matrix}$$

So, we can define speed also as, distance per unit time.

The measuring unit of speed may be :

Kilometer Per Hour (km/hr) **Meter Per Second (m/sec)**

Note

The speed of an object is not affected by the direction of this moving object.

Example :

If a car moves forward 5 meters in one second, then it moves backward 5 meters in one second, so its speed is still 5 meters per second.

Problems :

1. Amir runs 100 meters in 20 seconds. Calculate the speed of Amir.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{100}{20} = 5 \text{ m/sec.}$$

Distance = 100 m.
Time = 20 sec.

affected	يتأثر	distance per unit time	المسافة لوحدة الزمن	certain	معين
measurement	قياس			motorcycle	دراجة نارية

2. If a bus traveled 600 kilometers in 5 hours. Calculate the speed of the bus.

Distance = 600 km.
Time = 5 hours

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{600}{5} = 120 \text{ km/hr.}$$

Comparing the speed of two moving objects :

▸ **To compare the speed of two moving objects, we can use one of the following two ways :**

1. Measure the distance that both objects travel in the same amount of time.

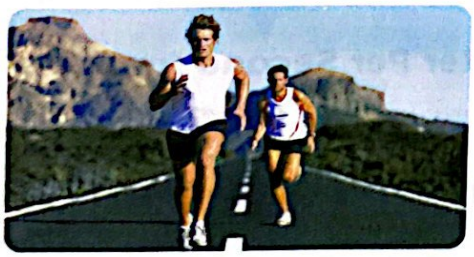
- The object that travels a greater distance in the same amount of time is moving at a greater speed.

- Example :
If two runners run for 1 hour, where :

- The first runner travels 6 kilometers.

- The second runner travels 9 kilometers.

So, the second runner is moving at a greater speed, because he travels a greater distance (9 km) in the same amount of time (1 hour).



2. Measure the time that both objects take to travel the same distance.

- The object that travels the same distance in a smaller amount of time is moving at a greater speed.

- Example :
If two cars are racing 120 kilometers, where :

- The first car reach the end line of race in 1 hour.

- The second car reach the end line of race in 2 hours.

So, the first car is moving at a greater speed, because it travels the same distance (120 kilometers) in a shorter time (1 hour).

Check your understanding

▸ **Complete the following sentences using the words below :**

(speed – faster – slower)

1. A car that travels 90 kilometers per hour is ..... than a car that travels 60 kilometers per hour.
2. Two bicycles are racing for 500 meters, the bicycle that finishes the race in a greater time is ..... than the bicycle that finishes in a shorter time.
3. The distance per unit time is known as .....

measure يحسب compare يقارن end line خط النهاية racing سباق

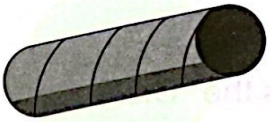
Activity 5 Racing Downhill

- You have learned about speed and energy, in this activity you will measure the speed and the kinetic energy of an object moving down a cardboard tube at various incline angles.
- **Now, let's study the relation between speed and kinetic energy.**

Tools

Toy truck

Metric ruler



Cardboard paper towel tube

Paper cup

Stopwatch

Scissors

Books

Steps

Part (1) : The relation between the speed and the angle of inclination.

1. Put one end of the tube on the top of two books, and the other end of the tube resting on the ground.
2. Record in a table the number of books used to set up the tube in the column "Number of books".
3. Roll the truck down the tube. Use the stopwatch to determine the time and record in the table how long the truck takes to travel to the end of the tube in the column "Time to travel".

4. Add one book to change the incline angle and repeat the steps, then add another book and repeat the steps again.

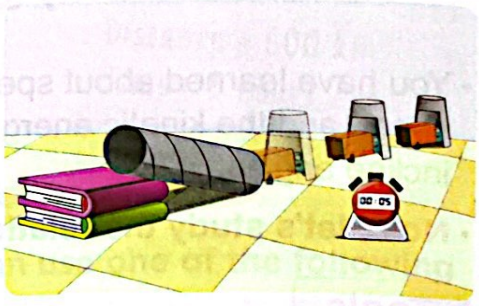
Note

As the "Time of travel" is less, the speed of the toy truck is higher.

cardboard tube	أنبوبة من الورق المقوى	angle of inclination	زاوية الميل	column	عمود
incline angle	زاوية الانحدار	resting	مستقرة	metric ruler	مسطرة مترية
towel	منشفة / فوطة	determine	تحديد		

Part (2) : The relation between the kinetic energy and the angle of inclination.

5. Now, repeat the activity as in part (1), but place the paper cup at the bottom of the tube as shown in the figure.



6. Measure the distance the cup moves each time after the truck rolls into it, and record in the table the distance that the cup travels in the column "Distance the cup traveled"

Note

As the "Distance the cup traveled" is longer, the kinetic energy of the toy truck is greater.

Number of books	Part (1)	Part (2)
	Time to travel	Distance the cup traveled
2 books	5 seconds	3 cm
3 books	3 seconds	4 cm
4 books	2 seconds	7 cm

Observations

- As the angle of inclination increases, the speed of the truck increases as it takes less time to reach the end of the tube.
- As the angle of inclination increases the distance that the paper cup traveled increases.

Conclusions

- As the speed of a moving object increases, its kinetic energy increases.
- Both speed and kinetic energy increase, as the angle of inclination increases.

Check your understanding

Complete the following sentences using the words below :

(increases – faster – kinetic)

1. If the incline of a ramp increases, the object rolling down it will be .....
2. When the speed of an object increases, its kinetic energy .....
3. We can use the speed of an object to know the ..... energy of this object.

In the Assessment Book :
Try to answer :
Self-Assessment (23)

ramp منحدر bottom الأسفل paper cup كوب ورقى

Exercises on Lesson 2

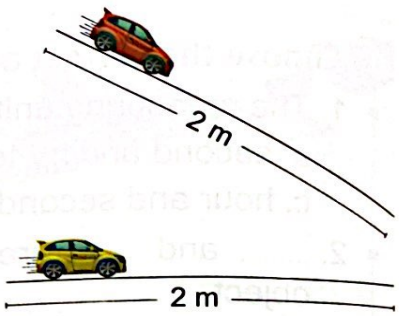
● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. The measuring units of distance are .....
   a. second and meter. b. hour and kilometer.
   c. hour and second. d. kilometer and meter.
2. ..... and ..... are the main factors that we need to calculate the speed of an object.
   a. time - kinetic energy
   b. distance - kinetic energy
   c. distance - time
   d. kinetic energy - potential energy
3. How can we calculate the speed of an object ? ..... *(Luxor 2023 / Alexandria 2022)*
   a. Speed = distance ÷ time b. Speed = distance x time
   c. Speed = distance + time d. Speed = distance – time
4. Which of the following is a measuring unit of speed ? .....
   a. hr/km. b. sec/m. c. kg/sec. d. m/sec.

   (Menofia 2023 / Cairo 2022)
5. What is the speed of a car that travels 400 meters in 4 second ? .....
   a. 100 m/sec. b. 20 m/sec. c. 30 m/sec. d. 40 m/sec.
6. When the kinetic energy of a moving body ..... , its speed ..... *(Sharkia 2023)*
   a. increases – doesn't change. b. increases – increases.
   c. decreases – doesn't change. d. decreases – increases.
7. As the angle of a ramp decreases, the speed of a toy car rolling on it ..... and its kinetic energy .....
   a. increases – decreases. b. increases – increases.
   c. decreases – decreases. d. decreases – increases.
8. An object keeps moving with same speed when .....
   a. its kinetic energy decreases.
   b. its potential energy increases.
   c. no another force stops it.
   d. another object collides with it.
9. If the angle of inclination of a hill increases, the kinetic energy of an object moving down it will .....
   a. decrease. b. increase. c. remain as it is. d. be destroyed.

10. The following figures show a ramp and a flat surface of 2 meters length for each. If two toy cars of equal mass are pushed with equal force at the same moment, so .....



a. both cars reach the end of the ramp at the same moment.
b. the yellow car reaches the end of the ramp first.
c. the red car reaches the end of the ramp first.
d. the yellow car has kinetic energy larger than that of the red car.

2 Put (✓) or (✗) :

1. The speed is a measurement of how fast something is moving. ( )
2. The speed is distance per unit time. ( )
3. We can measure the covered distance in kilometer unit. *(Minia 2023)* ( )
4. When Rana runs 50 meter in 10 seconds, her speed is 500 m/sec. ( )
5. If car (A) covered a distance of 100 kilometers in one hour and car (B) covered a distance of 100 kilometers in two hours so, car (B) is faster than car (A). ( )
6. The angle of inclination of a ramp affects the speed of an object moving on it. ( )
7. If two objects cover the same distance in the same time so, they have similar speed. ( )
8. When an object moves down on a ramp, its speed increases by decreasing the angle of inclination of the ramp. ( )
9. When two similar objects move with the same speed, they have different kinetic energies. ( )

3 Write the scientific term of each of the following :

1. The distance that an object travels in a certain amount of time. (.....)
2. The measuring unit of the speed. (.....)

4 Correct the underlined words :

1. When the speed of an object <u>increases</u>, its kinetic energy decreases. (.....)
2. When the angle of inclination of a ramp increases, the speed and kinetic energy of an object moves down on it <u>decreases</u>. (.....)
3. When an object moves at a very high speed, it has a <u>small</u> amount of kinetic energy. (.....)

5 Complete the following sentences :

1. When the speed of a car increases, its ..... energy increases. *(Suez 2023)*
2. A car with speed = 60 km/hr, its kinetic energy is ..... than that of another car with speed = 40 km/hr, if they have the same mass.
3. A train that travels 150 kilometers per hour is ..... than another train that travels 100 kilometers per hour.
4. The speed depends on the distance that is measured in kilometers or ..... and the time that is measured in ..... or .....
5. A car covers 80 meters in 4 seconds, so it moves at a speed equals ..... m/sec.
6. If the kinetic energy of a moving body decreases, its speed will .....
7. If the angle of inclination decreases, the speed of an object moves down on it will .....

6 Give reasons for :

The speed of a truck is more than that of a small car when both of them roll down on the same ramp.

.....

.....

7 What happens if ... ?

1. The speed of a car increases. *(Giza 2023)* (according to its kinetic energy)

.....

.....

2. We increase the angle of inclination of a ramp on which a toy car moves. (according to the speed of the toy car).

.....

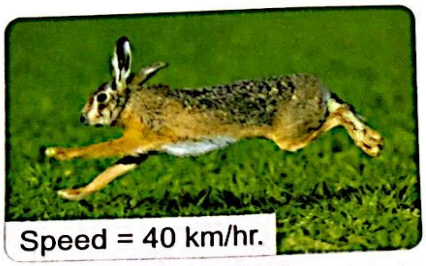
.....

8 Look at the opposite photos then answer the questions below :

1. Which one of the two animals has greater kinetic energy (rabbit or tortoise) ? (Give a reason for your answer).

.....

.....



Speed = 40 km/hr.

Speed = 1 km/hr.

2. If the speed of the rabbit decreases, so its kinetic energy will ..... (Complete).

9 **Find the speed of a runner, if you know that he covers 400 meters in 80 seconds.** *(Giza 2022)*

.....

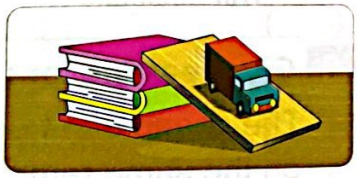
.....

10 **A train travels from Cairo to Alexandria in a distance of 200 kilometers in 2 hours. Find its speed.** *(Cairo 2023 / Minia 2022)*

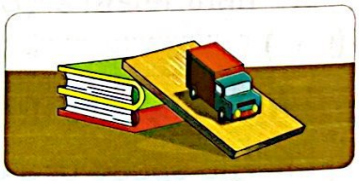
.....

.....

11 **Look at the opposite figures that show a toy truck moves down two different ramps, then answer the questions below :**



Ramp Ⓐ



Ramp Ⓑ

1. Which ramp makes the truck has more speed ? (Give a reason for your answer).

.....

.....

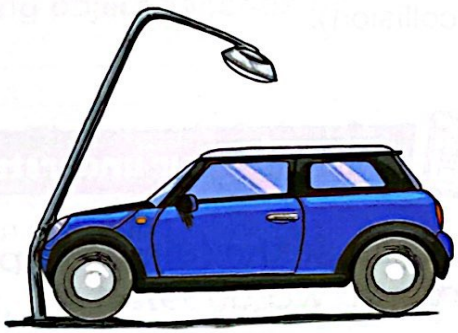
2. What happens to the speed of the truck when increasing the angle of inclination of ramp (B) ?

.....

LESSON THREE

Activity 6 Energy and Collisions

▶ **Look at this picture, then put (✓) or (✗) :**



1. Before collision the moving car has a potential energy as it is running on the street. ( )
2. During collision between two objects, there is no change of energy occur. ( )

- In this activity we will learn the effect of collision on energy transfer.

Energy and collisions :

- When you and your friend crash with each other, we can say a collision happens between both of you.

Collision:

It is the bumping or crashing of two objects into each other.

When two objects collide with each other :

- An amount of energy transfers between them.
- Changes of energy occur.

Example of collision between two objects :

What happens if you are running down the street without looking in front of you and hit a traffic sign post ?

▶ **In this situation :**

- You will stop moving forward.
- You may bounce off and get hurt.
- The traffic sign post may vibrate.

cart	عربة	traffic sign post	لوحة إشارات مرورية	bump	صدم
bounce off	ترتد	get hurt	تتعرض للإصابة		

▸ **In the previous example, what are the changes and transfer of energy that take place ?**

- The kinetic energy transfers from your body to the traffic sign post. This leads to the vibration of the traffic sign post.
- A part of your kinetic energy changes into a sound energy (the sound you hear on collision).

Check your understanding

▸ **Look at the following picture, then complete the sentences using these words :**

(kinetic – collides – cart)

1. The bicycle has ..... energy as it is running on the street.
2. When the cyclist ..... with the bread cart, the kinetic energy of the bicycle transfers to the ..... and the bread, that causes the cart tips over and the bread scatters.

cyclist سائق الدراجة / الدراج | tips over تقع | scatters بتبعثر

Activity 7 The Effect of Speed on Collisions

▸ **From the previous activities, you have learned that as the incline of the ramp increases, the speed of the object increases.**

The amount of kinetic energy of a moving object depends on

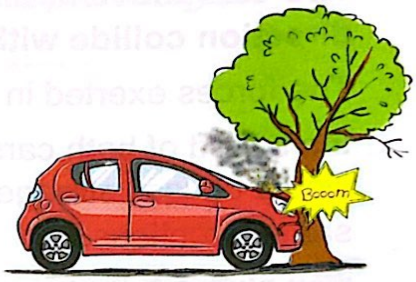
- **The mass of object.**
- **The speed of object.**

• **Now,** we are going to study the effect of speed on collisions.

▸ **When a fast object crash into another object, the faster object transfers some of its energy to the other object, where :**

• By increasing the speed of the object, the energy that transfers during collision will increase.

• Some of this transferred energy may be in the form of heat, light or sound.



▸ **Comparison between a fast-moving object and a slow-moving object :**

Fast-moving object	Slow-moving object
• It has more energy.	• It has less energy.
• When this object hits another object, it exerts more force.	• When this object hits another object, it exerts less force.
• This force causes a big damage to the object that cannot be repaired. 	• This force causes less damage to this object than the fast-moving object. 

exert بذل | inclined مائل | damage تلف | repair إصلاح

Note

Driving fast is very dangerous, because if a car increases its speed, its kinetic energy increases that results in exerting a large force during an accident.

What happens if ... ?

1. Two cars move at different speeds in opposite directions collide with each other ?

The forces exerted in the accident depend on the speed of both cars, so damage would be more stronger because they move in opposite direction.

2. Two cars move at different speeds in the same direction collide with each other ?

The forces exerted in the accident depend on the speed of both cars, this leads to damage that would be less stronger because they move in the same directions.

Check your understanding

▸ **Complete the following sentences :**

1. The amount of kinetic energy of an object depends on both ..... and ..... of this object.
2. Fast-moving objects have ..... kinetic energy, while slow-moving objects have ..... kinetic energy.
3. By increasing the speed of an object, its kinetic energy .....

In the Assessment Book :
Try to answer :
Self-Assessment (24)

Exercises on Lesson 3

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. When the speed of a moving object increases, the energy that transfers during its collision will .....
   a. increase. b. decrease.
   c. not change. d. equal zero.
2. A fast-moving object has ..... that of a slow-moving object.
   a. the same energy as b. more energy than
   c. less energy than d. no energy as
3. The two factors affecting the kinetic energy of an object are .....
   a. its speed and the color. b. its mass and the color.
   c. its speed and the mass. d. its light and the sound energies.
4. As the mass of a vehicle increases, it needs ..... to .....
   a. less force – less potential energy.
   b. more force – more potential energy.
   c. less force – less kinetic energy.
   d. more force – more kinetic energy.
5. When two objects of the same mass move with the same speed collide with each other, the resulted damage .....
   a. is larger in one of them and smaller in the other.
   b. is equal in both of the two objects.
   c. doesn't depend on the mass of the two objects.
   d. doesn't depend on the speed of the two objects.
6. On collision, energy is .....
   a. created. b. destroyed.
   c. created and transferred. d. transferred and change.
7. When car and truck collide with each other in opposite directions, ...
   a. the car has more energy and cause more damage.
   b. the truck has more energy and cause more damage.
   c. the car has less energy and cause more damage.
   d. the truck has less energy and cause less damage.
8. All the following factors affect the kinetic energy of a moving car, except .....
   a. the mass of the car.
   b. the pushing force of the car engine.
   c. the airbags inside the car.
   d. the inclination of the road on which the car moves.

9. The mass of an object .....
   a. doesn't affect its potential energy or its kinetic energy.
   b. affects its potential energy and its kinetic energy.
   c. affects its potential energy only.
   d. affects its kinetic energy only.

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. A heavy object that doesn't move	a. has much kinetic energy.
2. A light object that doesn't move	b. has much light energy.
3. A fast object with a heavy mass	c. if it moves with a fast speed, it has much kinetic energy.
4. A slow object with a light mass	d. has low kinetic energy.
	e. if it moves with a low speed, it has low kinetic energy.

1. ..... 2. ..... 3. ..... 4. .....

3 Put (✓) or (✗) :

1. Fast-moving objects can be exposed to less damage than slow ones. ( )
2. A slow and light object has much kinetic energy. ( )
3. When you drive on high speed, the kinetic energy decreases. ( )
4. When two bikes collide with each other, an amount of energy transfers between them. ( )
5. You have to drive a car as fast as possible, because at high speeds you can avoid collisions. ( )
6. When you collide with an object a part of your kinetic energy may changes into sound energy. ( )
7. A slow-moving object has more energy and force than that of a fast-moving object. ( )
8. To increase the speed of a moving object, you can collide it with another object that moves in the opposite direction. ( )
9. When two heavy and fast cars move in opposite directions collide together, they produce very small amount of damage. ( )

4 Write the scientific term of each of the following :

1. The process in which two objects bump or crash into each other, and including an energy transfer. (.....)
2. The energy that can be heard and usually produced when two objects collide with each other. (.....)

5 Correct the underlined words :

1. By increasing the speed of the object, the energy that transfers during its collision will decrease. (.....)
2. When two cars collide with each other, the potential energy transfers from the faster car to the slower car. (.....)
3. A fast-moving object has more energy and force that cause less damage during its collision. (.....)
4. The effect of collision increases, when the speed of the body decreases. (.....)
5. Two objects of the same mass and placed at the same height, have the same kinetic energy. (.....)

6 Complete the following sentences :

1. The amount of kinetic energy of a moving object depends on its ..... and its .....
2. During collision of two moving bikes, ... transfers between them.
3. When two cars collide with each other, some of energy may change into heat , ... and .....
4. The bumping or crashing of two objects into each other is called .....
5. When a moving car hits a tree, a part of ..... energy of the car changes into a ..... energy which you hear it.

7 Give reasons for :

1. When two objects collide with each other, you can hear a sound.
   .....
   .....
2. Driving fast is very dangerous.
   .....
   .....

8 What happens if ... ?

Two bicycles move in an opposite direction, collide with each other.
.....
.....

9 **Look at the opposite photo, then choose the correct answer :**

1. The car has ..... energy that allows it to move on the road.
   a. light b. sound
   c. kinetic d. thermal

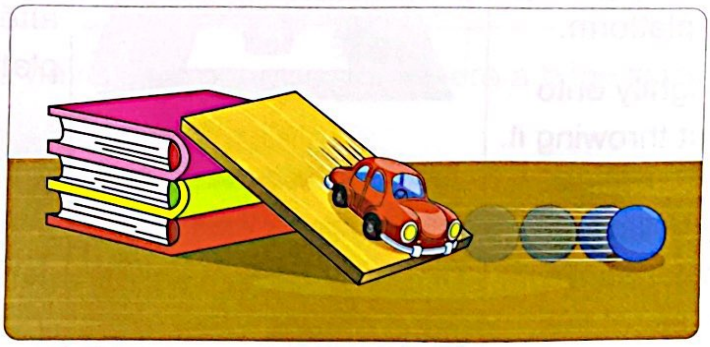
2. If the driver changes the ..... of the car, its kinetic energy will change.
   a. color b. speed
   c. lights d. temperature

3. All the following actions decrease the dangers that may be caused as a result of the collision, except .....
   a. increasing the speed of the car. b. using the seatbelt.
   c. adding more airbags to the car. d. decreasing kinetic energy of the car.

LESSON FOUR

Activity 8 Speed and Collisions

▸ **Look at this picture which represents a toy car collides with a small ball, then choose the correct answer :**



1. By increasing the speed of the car, the kinetic energy of this car .....

(decreases – increases – doesn't change)

2. The ball moves a distance due to ..... of the car.

(force – speed – force and speed)

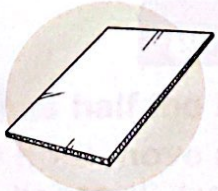
▸ **You have learned from the previous lessons that :**

① By increasing the force of an object	⟹	The kinetic energy of this object increases.
② By increasing the speed of an object	⟹	The kinetic energy of this object increases.

• **Now,** we are going to carry out an activity to show the effect of force and speed of a moving object on its kinetic energy during collision.

▸ **Tools**

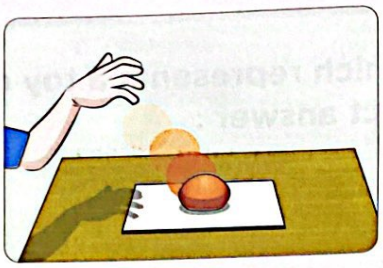
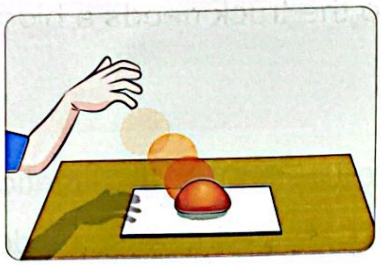
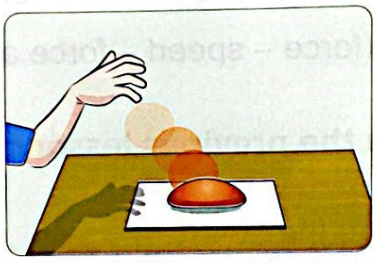
Ball of modeling clay



Piece of cardboard

Hard surface (wooden table)

carry out ينفذ | ball of modeling clay كرة من الصلصال

Steps	Figure	Observations
1. Use the cardboard to make a landing platform on a hard surface like a wooden table. 2. Hold the clay ball at a distance 1 meter above the platform. 3. Drop the clay ball lightly onto the platform without throwing it.		The shape of the clay ball changes a little and becomes irregular after hitting the platform.
4. Smoothen the clay ball over and lift it up to 1 meter above the platform, then repeat the experiment again, but this time throw the clay ball with a gentle force to increase its speed.		The shape of the clay ball change more and becomes more irregular after hitting the platform.
5. Repeat the experiment one more time and throw the clay ball with a hard force, so its speed increases much more.		The shape of the ball changes much more and becomes completely irregular after hitting the platform.

Conclusions

- As the force on an object increases, its speed and the amount of its kinetic energy increase.
- As the kinetic energy of a moving object increases, more damage will happen to this object during collision.

Check your understanding

▶ Put (✓) or (✗) :

By increasing the force on an object, its speed and kinetic energy increases. ( )

landing platform	قاعدة اختبار	hard surface	سطح صلب	gently	برفق
irregular	غير منتظم	smoothing	تنعيم	throw	يرمى

Activity 9 The Effect of Mass on Collisions

▶ **You have learned from the previous lessons the effect of speed on collisions.**

• **Now,** we are going to study the effect of mass on collisions.

The relation between the mass of objects and their kinetic energy :

- Different vehicles have different masses, where a large truck has a much greater mass than a car.
- If a large truck is traveling at the same speed of a car, the truck has more kinetic energy than the car, so the truck needs a bigger engine than the car.
- As the vehicle moves faster, the amount of fuel that burns inside its engine increases to provide it with more kinetic energy.
- As the mass of an object increases, its kinetic energy increases.

• **From the previous explanation, we can conclude that if the truck and the car move at the same speed, we will find that :**

The truck :
- Has a big mass.
- Has a big engine.
- Uses more fuel.
- Has more kinetic energy.

The car :
- Has a small mass.
- Has a small engine.
- Uses less fuel.
- Has less kinetic energy.

Give a reason for ...

• **The truck whose mass is 1 ton has half the kinetic energy of another truck that has mass 2 tons when they both move at the same speed.**

Because if the mass of an object increases, its kinetic energy at the same speed also increases.

vehicles	سيارات	fuel	وقود	ton	طن
truck	شاحنة	engine	محرك		

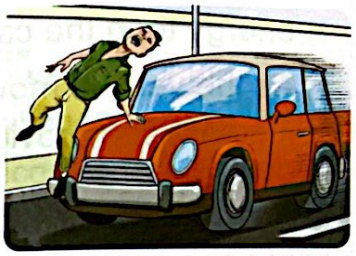
The effect of mass on collisions :

- A large-mass vehicle causes more damage when it hits something than a small-mass vehicle traveling at the same speed.

What happens if ... ?

1. A bicycle moving at a speed of 50 km/hr hits a person.

The bicycle will cause some injuries to this person, but he will survive.



2. A car moving at a speed of 50 km/hr hits a person.

The life of this person may be endangered.

Check your understanding

▶ **Put (✓) or (x) :**

1. A big truck has a big mass, while small car has a big engine. ( )
2. If the mass of an object increases, its kinetic energy increases. ( )

survive ينجو | injuries إصابات | endanger فى خطر

Activity 10 Energy Conversions During a Collision

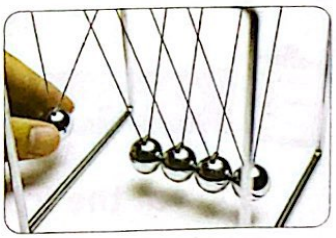
▶ **You have learned that when two objects collide with each other, transfer and changes of energy take place such as :**

- When you play a game with marbles, kinetic energy is transferred from your hand to the first marble, then there is another transfer of energy from your marble to the ones you hit.

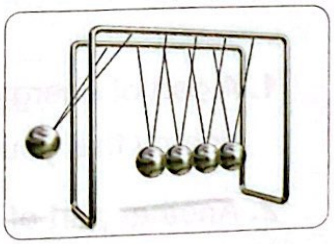
- Some of the kinetic energy is changed into sound energy when you hear the click sound during collisions between marbles.

Energy conversions during a collision of Newton's cradle :

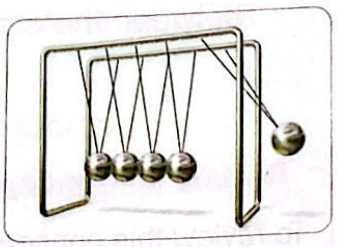
1. When Newton's cradle ball is raised up without leaving it go, it stores potential energy and doesn't have any kinetic energy.



2. When you leave the ball to move in the direction of the rest balls, the potential energy decreases gradually and changes into kinetic energy.



3. Most of kinetic energy in the Newton's cradle is transferred from the first ball to the rest of balls, so the number of balls moving on both sides is equal.



marble بلية | conversions تحولات | Newton's cradle بندول نيوتن

▶ **In the previous example, some of kinetic energy of the first ball is changed during collision into :**

1. Sound energy	2. Thermal energy	3. Other forms of energy
Some of this kinetic energy changes into sound energy that is produced during the collision between balls.	Some of this kinetic energy changes into thermal energy that is produced due to the friction between the string and the other parts of Newton's cradle and also during collision between balls.	Some of this kinetic energy changes into other forms of energy due to the friction of air with the ball during its movement.

Notes

1. If you leave the moving balls of Newton's cradle long enough, their kinetic energy decreases gradually until they stop after lots of collisions.
2. Energy is conserved during collision, so it cannot be destroyed, and the amount of energy before the collision is equal to the amount of energy after the collision.

Check your understanding

▶ **Look at the following picture that shows a car collides with a traffic sign post, then complete the following sentences using these words :**

(thermal – sound)

1. A part of energy is changed into ..... energy that you can hear.
2. Another part of energy is changed into ..... energy due to friction between the car and the traffic sign post.

Review on Concept (2.3)

To review this concept look at the **Assessment Book** "**Part 2 : Final Revision**".

In the Assessment Book :

Try to answer :

- Self-Assessment (25)
- Model Exam on Theme (2)

string خيط conserve يحفظ

Exercises on Lesson 4

● Understand ○ Apply ● Higher Thinking Skills

1 Choose the correct answer :

1. A very big truck needs ..... to move.
   a. very small engine b. small engine
   c. very big engine d. no engine
2. As the force that acts on an object increases, its ability to do work .....
   a. increases. b. decreases.
   c. doesn't changed. d. destroyed.
3. The amount of fuel that is used in a big truck to produce a certain amount of kinetic energy is ..... the amount of fuel in a small car to get the same amount of kinetic energy.
   a. less than b. equal to
   c. more than d. half to
4. On a flat road, if a large truck is traveling at the same speed of a small car, then the truck has .....
   a. more kinetic energy.
   b. less kinetic energy.
   c. the same kinetic energy of the car.
   d. no kinetic energy at all.
5. When a car stops, all the following become zero, except .....
   a. speed. b. kinetic energy. c. mass. d. work.
6. When a moving car decreases its speed then stops, so .....
   a. its kinetic energy becomes zero.
   b. its light energy only becomes zero.
   c. its light energy and thermal energy become zero.
   d. its kinetic energy becomes equal to its thermal energy.
7. If two objects collide with each other, the energy after collision is ..... the energy before collision.
   a. triple b. double c. half d. equal to
8. When two balls are pushed away at the left side of Newton's cradle, this happens as a result of collision of ..... from the right side.
   a. one ball b. two balls
   c. three balls d. four balls

9. In Newton's cradle, when you move a ball away from the others and not let it go, so ..... that is stored in this ball.
   a. your potential energy is changed into kinetic energy
   b. your kinetic energy is changed into potential energy
   c. your sound energy is changed into kinetic energy
   d. your sound energy is changed into potential energy
10. The kinetic energy in Newton's cradle through the balls travels in ..... at each collision.
   a. three different directions
   b. the same direction of movement
   c. two opposite directions
   d. the form of chemical energy
11. When you throw a ball of clay strongly at a wall, there is .....
   a. no damage occurs to the ball.
   b. more damage occurs to the ball.
   c. energy is destroyed.
   d. energy is created.
12. At the same speed, a large mass object has ..... than that of a small mass object.
   a. less potential energy
   b. more potential energy
   c. less kinetic energy
   d. more kinetic energy

2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Large-mass vehicle with speed 100 km/hr	a. It has a big amount of kinetic energy.
2. Small-mass vehicle with speed 20 km/hr	b. It has no kinetic energy.
3. Small-mass vehicle that doesn't move	c. It has the most thermal energy.
	d. It has a small amount of kinetic energy.

1. ..... 2. ..... 3. .....

3 Put (✓) or (x) :

1. A small object moving at a low speed has a big amount of kinetic energy. ( )
2. The force that acts on an object doesn't affect its speed. ( )

3. The smaller the mass of the vehicle, the less fuel it consumes. ( )
4. Objects of equal masses and move at different speeds have the same kinetic energy. ( )
5. Speed and mass are the factors that affect the kinetic energy of a moving object. ( )
6. The moving balls in Newton's cradle will stop after lots of collisions because their kinetic energy is destroyed. ( )
7. Some kinetic energy is changed during collisions of balls in Newton's cradle, into sound and thermal energies. ( )
8. Among the forms of energy that don't exist in Newton's cradle during collisions are light and chemical energies. ( )

4 Correct the underlined word :

1. A two-tons truck has smaller amount of kinetic energy than that of one-ton truck moving at the same speed. (.....)
2. All moving objects always have light energy. (.....)
3. The larger the mass of a car, the less fuel it consumes. (.....)
4. The distance that the balls move on the two opposite sides on Newton's cradle increases gradually as time passes. (.....)
5. In Newton's cradle, the kinetic energy of moving balls increases as time passes. (.....)
6. The number of moving balls at one side on Newton's cradle must be more than those moving at the other side. (.....)

5 Complete the following sentences :

1. By increasing the force that acts on a moving object, its ..... increases that causes the increase of its ..... energy.
2. A car moving with speed 50 km/hr has ..... kinetic energy than that of a truck moving with the same speed.
3. In vehicles, the ..... energy that is stored in the fuel changes into ..... energy that allows them to move.
4. Most of ..... energy in the Newton's cradle is transferred from the first ball to the rest of balls.
5. When a marble hits another one, some of ..... energy changes into ..... energy which you can hear.
6. During collision between Newton's cradle balls, some of ..... energy changes into ..... energy due to the ..... between the string and the other parts of the cradle.
7. Due to ..... of air with Newton's cradle balls, some of ..... energy changes into other forms of energy.

8. In Newton's cradle, when you rise up one ball, it stores ..... energy that changes into ..... energy when you leave the ball to move.
9. The ..... energy decreases gradually when you leave the moving balls of Newton's cradle long enough until they .....

6 Give reasons for :

1. A truck needs a bigger engine than that of a small car to move with the same speed.

.....

.....

2. A car consumes less fuel than that consumed in a bus to move at the same speed.

.....

.....

3. You can hear a sound during collision between marbles.

.....

4. The amount of energy before collision is equal to the amount of energy after collision.

.....

7 What happens if ... ?

1. The pushing force that acts on an object decreases. (according to its kinetic energy).

.....

2. The kinetic energy of a moving car increases.
(according to the damage during collision).

.....

3. A truck and a small car move at the same speed. (according to kinetic energy).

.....

4. The Newton's cradle ball is raised up without leaving it go.
(according to its energy).

.....

5. You let the ball of Newton's cradle move towards the rest of balls.
(according to the change of energy).

.....

6. Friction occurs between the string and the other parts of Newton's cradle during collision. (according to the change of energy).

.....

8 **Arrange the following sentences to show the steps of collision of Newton's cradle balls in the correct order.**

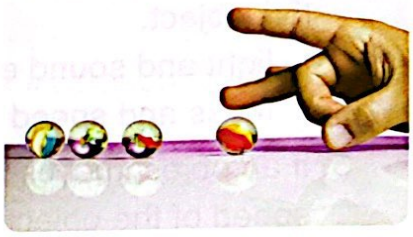
(.....) Kinetic energy is transferred from the first ball to the rest of balls.

(.....) Potential energy of the first ball decreases and changes into kinetic energy.

(.....) Kinetic energy of all balls decreases gradually until they stop.

(.....) Raise up the first ball, so it stores potential energy.

9 **Look at the opposite figure, then choose the correct answer :**



1. When you push the marble, the ..... energy of your hand transfers to the marble.
   a. sound
   b. thermal
   c. kinetic
   d. potential

2. During collision between your moving marble and other marbles, some of the ..... energy of your marble changes into ..... energy.
   a. sound – kinetic
   b. kinetic – sound
   c. thermal – kinetic
   d. sound – potential

3. If a marble rolls down a ramp, the speed of the marble decreases by .....
   a. decreasing the angle of the ramp.
   b. increasing the angle of the ramp.
   c. increasing the mass of the marble.
   d. decreasing the width of the ramp.

Model Exam 1 on Concept (2.3)

Total mark: 15

1 (A) Choose the correct answer : *(5 marks)*

1. When a car stops suddenly, the passengers move .....
   a. backward. b. downward.
   c. upward. d. forward.
2. The two factors affecting the kinetic energy of an object are ..... of this object.
   a. light and sound energies b. mass and color
   c. mass and speed d. speed and color
3. If an object moves down along a ramp, as the angle of the ramp increases the speed of the object will .....
   a. increase. b. not change.
   c. become zero. d. decrease.
4. As the mass of a vehicle increases, it needs ..... to move, so to get .....
   a. less force – less kinetic energy.
   b. less force – less potential energy.
   c. more force – more kinetic energy.
   d. more force – more potential energy.

(B) Give a reason for the following :

The speed of the ball increases when the cricket bat hits it hardly.

.....

.....

2 (A) Put (✓) or (✗) : *(5 marks)*

1. Some of kinetic energy of balls in Newton's cradle is changed during collisions into sound and thermal energies. ( )
2. Speed = Time ÷ Distance. ( )
3. After car collision, the air bags deflate as fast as they inflate. ( )
4. In Newton's cradle as the amount of the kinetic energy increases, the moving distance of the balls increases. ( )

(B) What happens if ... ?

Two bicycles move in opposite directions collide with each other.

.....

3 (A) Correct the underlined words : *(5 marks)*

1. All moving objects always have light energy. (.....)
2. Kinetic energy of an object doesn't depend on its speed which affects its potential energy. (.....)
3. The number of moving balls of Newton's cradle on one side must be more than those moving at the other side. (.....)
4. As the mass of a car increases, the damage that occurs during its collisions decreases. (.....)

(B) Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Kinetic energy 2. Potential energy 3. Light energy	a. form of energy that reaches the ear causing hearing. b. type of energy transferred from one moving ball to another rest one in Newton's cradle. c. the energy that doesn't exist in Newton's cradle during collision. d. the energy stored in the first ball of Newton's cradle when you raise it up.

1. ..... 2. ..... 3. .....

Model Exam 2 on Concept (2.3)

Total mark: 15

1 (A) Write the scientific term of each of the following : *(5 marks)*

1. A heavy steel ball that swings on a cable and used in destruction of parts of buildings. (.....)
2. The process in which two objects bump or crash into each other including an energy transfer. (.....)
3. They are present in car airbags and allow them to deflate fast after collision. (.....)
4. The energy that can be heard and usually produced when two objects collide with each other. (.....)

(B) Choose the correct answer :

1. When the Newton's cradle ball is raised up without leaving it go, its ..... energy is maximum and its ..... energy equals zero.

a. kinetic – potential
b. potential – kinetic
c. kinetic – sound
d. kinetic – thermal

2. When you leave the ball moves in the direction of the rest of balls some of kinetic energy of this ball changes into ..... and ..... energies.

a. sound – electrical
b. thermal – kinetic
c. kinetic – sound
d. sound – thermal

---

2 (A) Put (✓) or (✗) : *(5 marks)*

1. A smaller and slower object has more kinetic energy than that of a larger and faster object. ( )
2. In Newton's cradle as the height of the raised ball increases, it stores more potential energy. ( )
3. When an object decreases its speed gradually, so its kinetic energy decreases gradually. ( )
4. Seatbelt is one of the safety equipment in cars. ( )

(B) Arrange the following sentences to show the steps of collision of Newton's cradle balls in the correct order :

(.....) Potential energy of the first ball decreases and changes into kinetic energy.

(.....) Kinetic energy is transferred from the first ball to the rest of balls.

(.....) Rise up the first ball, so it stores potential energy.

(.....) Kinetic energy of all balls decreases gradually until they stop.

---

3 (A) Complete the following sentences : *(5 marks)*

1. When a moving car hits a tree, a part of ..... energy of the car changes into a ..... energy which you hear it.
2. A car covers 80 meters in 4 seconds, so it moves at a speed equals ..... m/sec.
3. If the mass of a moving object decreases, its kinetic energy will ..... at the same speed.
4. During a car crash, the ..... is inflated with a gas to provide a soft cushion.

(B) Give a reason for the following :

If two vehicles moves at the same speed, the vehicle with a large mass causes more damage than the vehicle with a small mass during collision.

.....

.....

For the Next term

Ask for

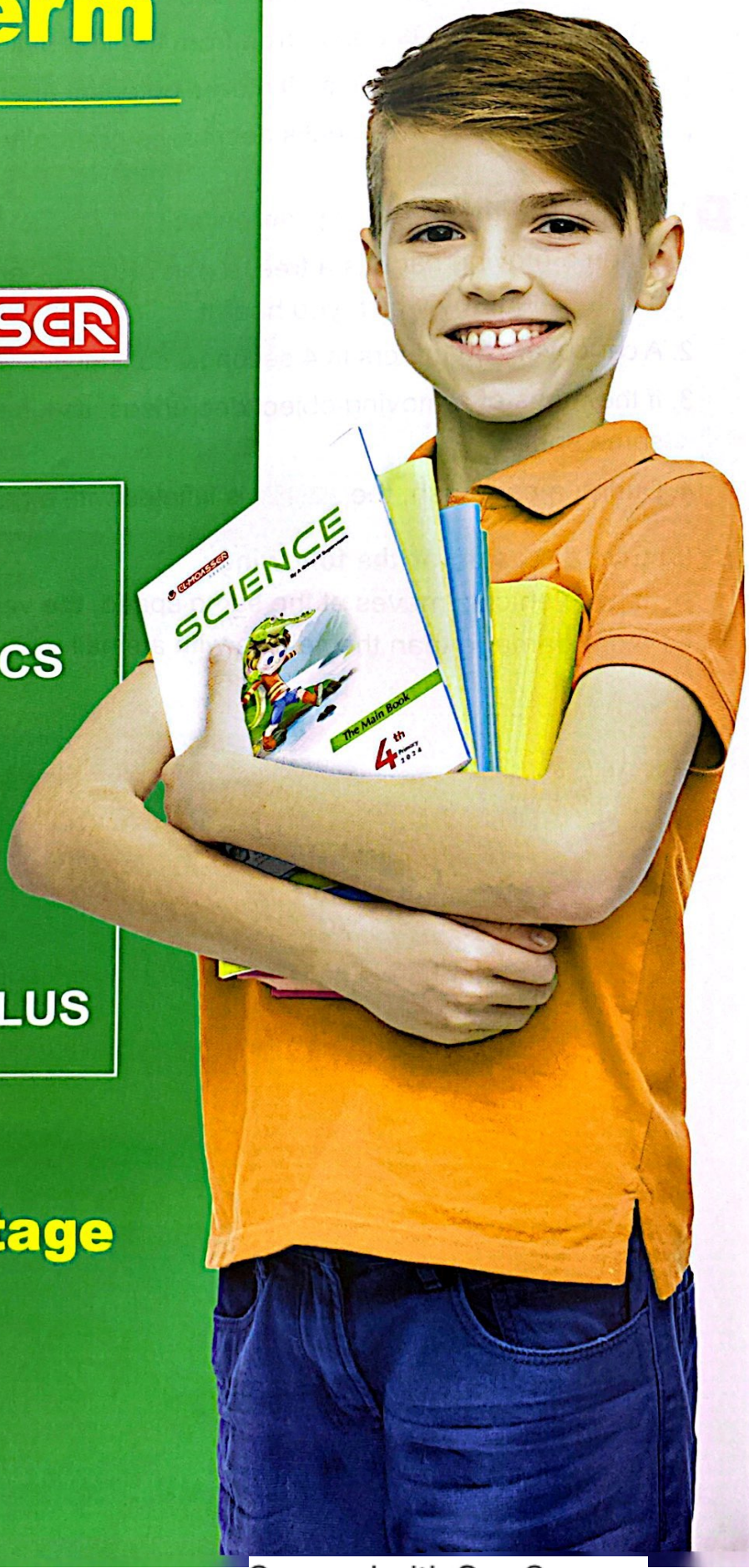
EL-MOASSER

in

- SCIENCE
- MATHEMATICS
- DISCOVER
- CONNECT
- CONNECT PLUS

For

Primary stage



SCIENCE

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